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Report of the Chief of the Forest Service, 1966

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U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Washington, D.C., June 1, 1967

HON. ORVILLE L. FREEMAN,
Secretary of Agriculture

DEAR MR. SECRETARY:

It is my pleasure to send you this report on Forest Service accomplishments for the year 1966. Herein are records which we are proud to have made, but in every case they reflect the vigorous leadership that you have given us for 5 productive and rewarding years.

I have referred to the great Third Wave of Conservation, now rolling forward dramatically. Surely we have reached new heights in the development of National Forest resources. The conservation programs of this Department are strengthening the bonds of cooperation between the Federal Government and the States and rural communities. Dynamic research is unlocking doors to new opportunities in the development of forest resources. In all of these areas we feel the continuing influence of two essential elements—strong high-level leadership and broad public support.

Under the hallmark of Agriculture/2000, we are confident that the varied values and resources of the Nation's forests—both public and private—will continue to play an enlarging role in building new and better communities all over America.

Sincerely yours,

Edward P. Cliff

EDWARD P. CLIFF
Chief, Forest Service

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Washington, D.C. 20402 - Price 35 cents

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This report covers calendar year activities unless otherwise identified. Records on a fiscal year basis are so reported. Mention of commercial companies, products, or services is solely for necessary historical identification and implies no endorsement.

The Forest Service, U.S. Department of Agriculture, is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

Issued August 1967

Report of the Chief of the Forest Service, 1966

Introduction—Highlights

Conservation's Great Third Wave moved forward dramatically in 1966. America's forests and related natural resources produced more goods and services for the American people and contributed more to community development than at any time in the past. Conservation received more public attention and public support than ever before—all of which shows that the Nation was getting back to more mature and fundamental issues.

The modern concept of natural resource conservation began in the forestry movement under Gifford Pinchot and Theodore Roosevelt. This has been called the great *First Wave of Conservation* in America. The *Second Wave* occurred under the strong conservation programs of the Franklin D. Roosevelt years. *Conservation's Great Third Wave* began when John F. Kennedy was inaugurated in 1961.

"I fully intend," said President Kennedy in his first message to Congress, "that the decade of the sixties will witness a strong surge forward in the conservation of all of our renewable resources—forests, soils, waters, and wildlife."

Under President Johnson's leadership, that "forward surge" is well on its way today—well on its way to making the sixties the greatest conservation decade the country has witnessed yet.

It was Gifford Pinchot, first Chief of the Forest Service and America's first professional forester, who called conservation "the greatest material question of all."

It was Pinchot who conceived the idea that all natural resources fitted into and made up one central issue: *the use of the earth for the good of man.* He called the concept "conservation" and defined it as wise use. Backed by aggressive leadership of Theodore Roosevelt, he implanted the concept in the minds of the American people. Thus, natural resource conservation, which is gaining such momentum today, grew directly out of the forestry movement in this country.

The Louis Harris opinion survey reported in November 1966 that the American people were angry about the continuing pollution of their rivers and streams. The report went on to say that the people were aroused and concerned over what was coming to be "a central issue of the times"—*the conservation of our natural resources*—the building of fundamental quality into our environment.

Professional conservationists are happy to see the movement raised once again to the forefront of public discussion. We in the Forest Service have always believed that when people fully understand conservation issues they will make the right decisions.

Pinchot said, "Conservation is the greatest material question of all." He believed it to be ". . . the key to the safety and prosperity of the American people, and all the people of the world, for all time to come. The very existence of our Nation, and all the rest, depends on conserving the resources which are the foundations of its life."

The following highlights reveal the pattern of progress and problems by which the Forest Service in 1966, its 62d year, has moved to resolve "the greatest material question of all."

Forestry Training for 412 Foreign Nationals. Our International Forestry Unit, during the past year, prepared or assisted with 138 forestry training programs or study tours for 412 foreign nationals. Nearly half of these (64) were sponsored by AID and included 189 participants; 21 programs (27 participants) were sponsored by the Food and Agriculture Organization of the United Nations; and 53 programs (with 196 participants) were sponsored by individuals themselves, by their employers, international foundations, or governments—and by the U.S. Department of State through its educational and cultural exchange programs.

Another Billion Trees Planted. Steady progress in tree planting continued for the year. Fiscal year 1966 saw a total of 1,319,819 acres planted or seeded on all lands throughout the country, or just under a billion trees. This is approximately the same planting rate maintained for the past several years. In 1965 it was 1,327,285 acres.

About 70 percent of this was on State and private lands where there is the greatest need for planting. On private lands, a little more than half was done by forest industries, such as lumber and paper companies.

On Federal lands (mainly National Forests) 301,225 acres were planted. Of the total planting on all lands, 177,974 acres were seeded directly by broadcasting seeds from aircraft or by hand rather than putting in seedlings or young trees.

Forestry Co-ops Gain Foothold. We have been

actively promoting, encouraging, and assisting in the organization of forestry cooperatives as a means of achieving better management and marketing of forest products on privately owned lands. A number of such co-ops are coming to life. Three new co-ops are being organized in Minnesota to process and market maple syrup; a new co-op in the State of Washington is providing management and marketing services; a three-State co-op has been started in Michigan, Wisconsin, and Minnesota.

The AuSable Forest Products Association of East Tawas, Mich., is a good example of what a forestry co-op can do. When it was first organized in 1940, there were scattered stands of private timber in the area and some National Forest timber available, but wood-using industries were not getting a dependable supply of raw material. Beginning with 20 charter members, the co-op handled $3,000 worth of wood the first year. Now, 26 years later, it averages 150 members and handles about $400,000 worth of timber products each year.

Progress on Wilderness. On December 15, 1966, Secretary Freeman recommended to the President that the San Rafael Primitive Area and certain additions be established as the first new unit in the National Wilderness Preservation System since passage of the Wilderness Act of September 3, 1964. President Johnson proposed this new Wilderness in his Message to Congress of February 1, 1967. Approval by Congress would establish a 142,722-acre San Rafael Wilderness in the Los Padres National Forest in California.

When the National Wilderness Preservation System was established, the 54 National Forest Wilderness Areas—9.1 million acres—were all the wilderness that went into it and nothing has been added since then. However, progress is being made toward bringing other federally owned lands into the system.

The Wilderness Act required the Forest Service to complete studies and make recommendations for or against wilderness status on one-third of the 34 National Forest Primitive Areas by September 3, 1967. We have been busy in this process. Action on the San Rafael culminates the long and complex job for the first of the 12 Primitive Areas on which recommendations are being prepared for transmittal to the President and the Congress.

In addition to the intensive preparatory work, public hearings were held in 1966 or early 1967 on the following proposed wildernesses: San Rafael, San Gabriel, Spanish Peaks, Mount Baldy, Flat Tops, High Uintas, Pine Mountain, Washakie, Sycamore Canyon, Ventana, and Desolation Valley.

New regulations had to be developed, and these were issued by Secretary Freeman June 1, 1966, governing those portions of National Forest land in the Wilderness Preservation System.

The new regulations represent our best efforts to find reasonable ways to administer authorized nonwilderness uses as well as wilderness uses, and at the same time do what the law directs, which is to protect the wilderness and preserve its wilderness character.

The Second Billion Mark Passed. This year the Forest Service passed the second billion point in cash income (March 1, 1966). The $2 billion represents accumulated gross income from National Forest resource uses (89 percent from timber sales) over the past 61 years, beginning in 1905 when the Forest Service was established.

It took 53 years for the National Forests to earn the first billion, which was reached in 1958. This was the result of steady and sometimes difficult development of the National Forest resources. But the foundation was firmly established, and these same resources earned their second billion in only 7 years. If the present rate of intensive management is sustained, the third billion will be realized in less than 6 years.

1966 Receipts Hit Record. Forest Service cash receipts from the use of all resources in fiscal 1966 reached an all-time record at $173,900,000—up $26.5 million over the previous year. National Forest timber sales brought in 94.8 percent of this; the remainder came from grazing fees, recreation concessioners' permits, and other uses.

Some National Forest receipts are not counted in the total above. Sales of Federal Recreation Area Entrance Permits provide revenue for the separate Land and Water Conservation Fund. States receive revenue from fishing and hunting licenses, though the sportsman may take his game entirely from National Forests. Fees for water-power licenses are paid to the Federal Power Commission, and mineral leases on National Forests are handled by the Bureau of Land Management, Department of the Interior.

Receipts have increased during the past decade for several reasons. A stepped-up program of multiple use management resulted in a Service-wide increase in the allowable timber cut, and greater demand for the timber has come with the expanding economy. Lands that were in poor condition when acquired by the Forest Service are now producing valuable timber, forage, and recreation. Recreation use of Federal lands in the past decade has also grown greatly.

Record National Forest Timber Harvest. Fiscal year 1966 saw the biggest harvest of timber that has ever come from National Forests—12.1 billion board feet, with a value of $196 million, a value increase of $35 million over the previous year. (Value is greater than cash receipts, since timber value includes funds for planting and stand improvements by timber purchasers on cut-over areas under the Knudson-Vandenberg Act.)

Timber harvested from the 154 National Forests represents a vast economic force that is felt in

thousands of communities across the land—in jobs, buying power, and prosperity on main street.

The 1966 record harvest:

—represents one-fourth of all timber cut in the country.

—generated almost $5 billion into the Nation's economy.

—provided employment for nearly a million people.

—would build 1.2 million homes, enough to house the population of metropolitan Philadelphia.

Under sustained yield management and improved practices, this and even larger harvests of timber can be produced by National Forests year after year, forever—as new uses are found for lower grade trees, and as inaccessible timber stands are opened up.

Record $42 Million Returned to States. The increase in timber and other receipts resulted in a record $42 million being returned to the States in which National Forests are located. This is the "25 Percent Fund" which the States receive annually for support of public roads and schools in counties where National Forests are located.

National Forest Recreation Remains High. National Forest and National Grassland recreation facilities continued to feel the pressure of heavy public use. During the year, we counted 150,700,000 visitor-days of use, in the most intensive measurement ever made of National Forest recreation activity. In the second year in which Federal agencies have used the new visitor-day unit, we made statistical samplings on 80 percent of the National Forests and compiled site-by-site estimates for all areas, providing accuracy hitherto unavailable. To meet the continuing need for recreation facilities, we have expanded the capacity of developed sites to accommodate 592,000 people at one time.

Forest Fires in 1966 burned over a total of 4,474,389 acres on all lands throughout the country in 122,500 fires.

This loss resulted from one of the most severe fire seasons in recent times. While fire control forces were able to stop more than 93 percent of the fires at a small size, many spread rapidly through critically dry forest fuels despite prompt, aggressive attack. Major efforts were required to bring them under control. Southeastern States in particular were hard hit.

On the 215 million acres of the National Forest protection area (extending somewhat beyond National Forest boundaries), 11,245 fires burned 332,900 acres—the largest area burned since 1960, and more than double the 1961–65 annual average of 139,315 acres. Of the 11,245 National Forest fires, 5,374 were caused by people, and 5,856 were caused by lightning.

Eleven Firefighters Killed in California. The Nation was shocked at the tragic loss of 11 firefighters on the "Loop" fire in the Angeles National Forest in California, November 1. A four-man Forest Service team analyzed this accident with the aim of preventing wherever possible such tragedies in the future.

The Sixth World Forestry Congress, held in Madrid, Spain, June 1966, drew 2,800 foresters and associates from 93 nations. The largest international forestry meeting ever held, it focused on the theme: "The Role of Forestry in the Changing World Economy." Previous Congresses were in Rome, Italy, 1926; Budapest, Hungary, 1936; Helsinki, Finland, 1949; Dehra Dun, India, 1954; and Seattle, Washington, U.S.A., 1960. Dr. F. Ortuno of Spain was President of the Sixth Congress, and former Forest Service Chief Dr. R. E. McArdle and Finland's Dr. E. Saari were honorary Presidents. Chief Cliff headed the United States Delegation and served as one of the Vice Presidents.

"Multiple use" figured in a number of papers from other countries, indicating that this management principle, which was the theme of the Fifth World Forestry Congress, is spreading far beyond our own borders.

Grazing Fee Study Progresses. An important new grazing fee study, sponsored jointly by USDA and the Department of the Interior, was launched September 22, with the goal of finding a more uniform approach to fees charged on Federal land. Field work—interviews with grazing permittees and private land lessees, and evaluation of fees—is being carried out by USDA's Statistical Reporting Service. Data processing should be completed by July 1, 1967.

Target date for fee adjustments is the 1968 grazing season. During the spring and summer of 1967, project data will be evaluated. Results of the studies will be discussed with the livestock industry at the joint National Cattlemen's Association and the National Woolgrowers Association meeting in the fall of 1967.

Building Resources and Citizens. At the end of 1966, 7,000 Corpsmen were enrolled in the 47 Forest Service-operated Job Corps Conservation Centers, located on National Forests in 29 States. These young men, 16 to 21 years old, were receiving education, training, and work experience to prepare them for meaningful employment and a role as self-supporting citizens. During the year, 6,500 successfully completed the program. From job corps they went on to accept a job, reenter a high school or college, enter military service, or continue vocational training at an Urban Job Corps Center. This is a joint endeavor of the Forest Service and the Office of Economic Opportunity.

Forest Service experience has shown that Job

Corps work is a real opportunity and challenge—a chance to build good citizens and improve natural resources at the same time. At these Conservation Centers, a trained staff spends hour after hour helping corpsmen to understand why it is important to study, to work safely, to work without close supervision, to come to work on time, and to be properly dressed on the job. Gradually, the untrained become trained—as dependable workers and constructive members of society. The Forest Service is proud to play a part in helping these young men, almost forgotten by an affluent society.

Rural Community Development. In support of Secretary Freeman's emphasis on development of disadvantaged rural areas, the Forest Service has intensified its efforts in a number of anti-poverty programs. These include the Rural Job Corps Conservation Centers, Manpower Development and Training, Work Experiences, and Neighborhood Youth Corps. We have had especially promising results in a pilot project in Mississippi under the Nelson Amendment to the Economic Opportunity Act, where local men acquired needed vocational skills while working on National Forest conservation projects and became better qualified to enter the local labor market. Low-income families are helped by the free use policy of the National Forests, which allows them to obtain fuelwood and other low-grade wood products for domestic use.

As in the past, use of National Forest resources substantially helps local economies. Timber operations provide several hundred thousand jobs, and recreation is increasingly bringing new sources of income to communities in or near National Forests. The Forest Service provides technical assistance and review for rural community development projects and its personnel serve on many technical action panels in support of Rural Areas Development.

Smokey's Message Reached New Millions. In addition to the many usual ways Smokey Bear reaches the public with his fire prevention message, Thanksgiving Day 1966 was a bonus day for enlarging his audience. In the morning, about 40 million folks (in person and via TV) saw a 59-foot high Smokey in the Macy Parade in New York. That evening, Smokey starred in an hour-long musical, "The Ballad of Smokey The Bear."

This animated fullcolor feature was the third in a series of General Electric "Fantasy Hour, specials that included "Rudolph the Red Nosed Reindeer" and "Return to Oz." It was seen via TV in an estimated 15 million homes by perhaps 50 million viewers. It is being rescheduled for a second showing sometime in 1967.

Endangered Wildlife Gets More Support. The Endangered Species Preservation Act of 1966 (P.L. 89–669) will give more emphasis to our work to protect rare and endangered wildlife and fish on National Forests.

Under this new law, the Interior Department has named 78 mammals, birds, reptiles, and fishes in the United States as threatened with extinction.

The Forest Service has had for some time programs to protect certain species. For example, the California Condor—largest bird in North America, with only about 40 living specimens—is protected in the 53,000-acre Sespe Condor Sanctuary in the Los Padres National Forest; and one of the smallest birds, the Kirtland's Warbler, enjoys red-carpet treatment on the 4,000-acre Kirtland's Warbler Management Area on the Huron Forest in Michigan.

Other endangered species that occur on the National Forests and National Grasslands include the Puerto Rican parrot, timber wolf, red wolf, grizzly bear, blackfooted ferret, and southern bald eagle. Endangered fish species include the Little Colorado spinedace and the Piute, greenback, and Gila cutthroat trout. Some of the species classified as "rare" are the Kaibab squirrel, glacier bear, California bighorn, lesser prairie chicken, and the Arctic grayling.

Golden Eagle Passport Sales Up. The $7 Federal Recreation Area entrance permit took the form of a wallet-size card, and scored impressive sales gains at the 2,040 recreation areas in National Forests. This brought $1,200,000 into the Land and Water Conservation Fund, administered by the Bureau of Outdoor Recreation. The "passport," good for 1 year, admits the holder and occupants of his car to all designated Federal recreation areas with improved facilities. Money in the fund is appropriated to buy land with recreational potential, or otherwise provide more public recreation opportunities on local and State lands.

Campground or other fees had been charged on some National Forest areas before this law came into effect—and a great many areas remain available for public use without charge. Short-term permits are available for those who do not wish to buy the Nation-wide passport.

The Sylvania Estate, in Michigan's Upper Peninsula on the Michigan-Wisconsin line, is the outstanding piece of property acquired by the Forest Service in 1966 with money from the Land and Water Conservation Fund. This is an 18,000-acre area of lakes, woods, and shoreline within a day's drive of Chicago; Minneapolis-St. Paul; Madison, Wis.; Duluth, Minn.; and other cities. It contains valuable virgin timber and is heavily populated with fish and game. This tract is expected to become one of the showcase recreation areas in the country.

New Weapon Against Bark Beetles. Research scientists scored a major breakthrough in the control of tree-killing bark beetles and moved one more step towards eliminating widespread use of toxic sprays. A team of California scientists working under contract for the Forest Service has synthesized an attractant that lures one type of bark

beetle (*Ips confusus*), a pest of western pine. Once lured to concentration points, the beetles are easily eliminated.

More Appalachia Hardwood Can Go Into Paper. A research study by the Forest Products Laboratory shows that more low-grade Appalachian hardwoods can be used for making commercial paper toweling and tissues. By mixing softwoods with hardwood, our research showed that blends of up to 80 percent hardwood could be used—a much higher percentage than is now being used.

The mills in that region do not now make a pulp suitable for such products, but the study indicates that the potential is there. The wood is abundant and markets are close by.

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FORESTS COVER ONE-THIRD of the land in the continental United States. Over 70 percent of the commercial forests is owned by private citizens. The Forest Service cooperates with State agencies and private forest owners to (a) protect 450 million acres of State and privately owned forests and watersheds against fire, insects, and disease; (b) encourage better forest practices for conservation and profit on the 367 million acres of private forest land; (c) aid in distribution of planting stock for forests and shelterbelts; and (d) stimulate development and management of State, county, and community forests.

Cooperation—State and Private Forestry

The first mill to manufacture plywood in Colorado was established through community and industry action, technical assistance from the Forest Service, and a loan from the Area Development Administration (now Economic Development Administration). This $4 million investment in the Cortez-Dolores area of southwestern Colorado will provide jobs for 270 persons at the mill and 180 men in the woods.

The mill will require 35 to 45 million board feet of timber annually to produce interior and exterior sheathing. It will draw its supplies from the ample, well-managed stands of Engelmann spruce in the nearby San Juan National Forest.

The first 6 months of operation showed a new payroll in the community of over half a million dollars, a sharp increase in natural gas and electric power consumption in the county, about 2,000 truckloads of logs delivered, and over 22 million square feet of plywood produced for the market. The plant now employs 191 people.

This is one of many examples of assistance given to help develop or upgrade forest industries, local economies, and small private forest lands through cooperative forestry programs. Behind this assistance is the technical know-how and the many resources of the Forest Service in close working relationship with State Foresters and their State and federally financed service foresters. Behind this assistance is also the recognition that healthy, well-managed, productive public and private forest resources are essential to the well-being of the economy and the people, both nationally and locally.

S&PF Administration Strengthened

During the year, the Forest Service realined and strengthened its administration of cooperative State and private forestry programs. It did this by establishing two new area offices to aid Forest Service cooperative efforts with 33 eastern States. This separates such functions from the Regional Offices that manage eastern and southern National Forests. Each office is headed by an administrator with responsibilities equivalent to those of Regional Foresters and Station Directors. The Southeastern Area office in Atlanta coordinates the work with 13 State Foresters in the region bounded by Texas, Oklahoma, Arkansas, Kentucky, and Virginia. The Northeastern Area office coordinates work in 20 north-central and northeastern States.

The separation of State and private forestry functions from those of National Forest administration has put new emphasis on this major segment of Forest Service responsibility. The 33 States involved constitute an area of relatively little federally owned forest land; consequently the many cooperative programs are particularly crucial in the attainment of national forestry goals. In addition, the realinement has reduced overhead costs and has improved manpower utilization, since it has made possible the transfer of the direction of seven National Forests from the Northeastern Regional Office, which was closed, to the Regional Offices at Milwaukee and Atlanta.

FORESTS AND THE RURAL COMMUNITY

Rural Areas Development

Forests provide many resources and raw materials for income and job-producing ventures in rural areas. Many rural communities are utilizing their forest resources to strengthen their economies. A major objective of the Forest Service, working with State Foresters, is to increase the number of available jobs in rural areas to help stabilize the population. In many communities wood processing plants and forest-based recreational and other enterprises are helping to achieve this objective.

Forest Service and State forestry representatives serve on Technical Action Panels in every State to provide forestry assistance and advice to local development groups of all kinds. During 1966 the Forest Service reviewed and reported on 262 rural development projects; provided special assistance to 166 local development groups and 30 forestry cooperative ventures; and serviced more than 500 special loan, study, training and development projects.

FLOOD PREVENTION AND RIVER BASIN PROGRAMS

The Forest Service carries out flood prevention and watershed protection activities under several programs: The Flood Control Act of 1944, pilot watershed projects authorized in 1954, and the Small Watershed Program under Public Law 83–566, as amended. In assisting with, planning, or carrying out forestry measures under these programs, the Forest Service cooperates with local project sponsors, the Soil Conservation Service, State Foresters, and other Federal, State and local agencies. It acts directly to apply emergency flood prevention measures on non-Federal and National Forest lands. The Forest Service also cooperates with other Federal agencies and State governments in comprehensive river basin studies for the development of water and related land resources.

Flood Prevention Projects

Work continued on the forestry and fire control aspects of seven flood prevention projects authorized under the Flood Control Act of 1944. During the year 30.7 million trees were planted on eroding flood source lands. This planting, 90 percent of which was on the Yazoo-Little Tallahatchie projects in Mississippi, was done through the combined efforts of the Forest Service, Soil Conservation Service, Agricultural Stabilization and Conservation Service, Corps of Engineers, local soil and water conservation districts, and landowners.

Technical forestry assistance was given to 6,100 landowners and operators in correcting undesirable watershed conditions on private land. This action led to improved forest management on 67,000 acres and the stabilization of 5.5 miles of sediment-producing roads.

Fire prevention and control continued to be strengthened on 2,871,000 acres of private and National Forest lands within the project areas by the construction of 247 miles of fire control roads and trails and fire breaks and nine additional buildings for fire crews and equipment on critical watersheds. Other flood control measures included the stabilization of 35 miles of skid trails and logging roads, and the construction of seven channel barriers to stabilize stream channels and adjacent slopes on the Los Angeles River Project in California.

Public Law 566 Projects

Watershed protection and flood prevention projects are authorized under the Watershed Protection and Flood Prevention program of 1954 (P. L. 566). Local groups receive planning, technical, and installation assistance from Federal and State agencies under the general leadership of the Soil Conservation Service.

During 1966 the Forest Service worked with State Foresters, the Soil Conservation Service, and local sponsors in planning Watershed Protection and Flood Prevention improvements on 287 small watersheds. Work plans were approved and installations authorized on 94 new projects; 74 of these include accelerated programs for improvement of forest lands.

Forestry measures were installed on 209 projects. More than 13 million trees were planted on 13,884 acres of privately owned land. Technical forestry assistance for watershed improvement was given to 3,344 landowners involving 162,358 acres, and protection from forest fire was extended or strengthened on 350,000 acres. Other watershed improvements included hydrologic stand improvement and protection from grazing damage on 84,677 acres.

Public Law 566 improvements on National Forest lands included revegetation on 583 acres by grass seeding and tree planting; hydrologic stand improvement on 3,500 acres; and 28 miles of roadside erosion control measures.

River Basin Surveys

The Forest Service cooperated with the Soil Conservation Service, the Economic Research Service, and State agencies concerned in continuing studies of water and related land resources in many river basins throughout the country. These studies included cooperative surveys with the Corps of Engineers and the Bureau of Reclamation in 19 river basins and with State water resource agencies in water resources inventories and problem analyses of 15 river basins in 18 States.

FOREST PEST CONTROL

Insect Control

Forest insects were not quite as troublesome in 1966 as they have been during the past few years. Most of the control effort and funds were concentrated on bark beetles, which continued to be the number one insect problem. Attacks by mountain pine beetles in the Targhee and Teton National Forests in Idaho and Wyoming, and by the southern pine beetle in Alabama, Louisiana, Mississippi, North Carolina, and Texas caused heavy losses. These attacks are being checked by several control tactics including salvage logging, cutting and burning, or cutting and chemically treating infested trees to destroy the brood under the bark. Control work is continuing and every effort is being made to halt outbreaks early so that damage

will be held to a minimum. In 1966, 82 such outbreaks were stopped by prompt action, saving timber with an estimated value of $16.4 million.

Defoliating insects annually take a heavy toll of timber, disturb recreational areas, and mar the scenic beauty of the Nation's forests and parks. Spruce budworm is normally one of the most serious coniferous forest defoliators, and heavy defoliation was predicted for 100,000 acres in the Salmon National Forest in Idaho in 1966. Plans were made to suppress the expected outbreak by aerial spraying, but natural factors caused the population to collapse and the project was canceled. These factors also helped keep other defoliators such as the fall cankerworm, tent caterpillars, fir and pine tussock moths, and the sawflies in check. It was necessary to spray 60,800 acres on the Carson National Forest in New Mexico, and small acreages in the Gallatin and Lewis and Clark National Forests in Montana, to control spruce budworm. An infestation of the same insect in the Bitterroot National Forest in Montana was used as a pilot test area for a promising new nonpersistent insecticide. A tussock moth outbreak in the city of Santa Fe, N. Mex., which threatened valuable adjacent forest areas, was controlled by timely cooperative aerial spraying with DDT.

Other small projects were conducted during the year in various parts of the country to control pales weevil, balsam woolly aphid, cone and seed insects, European pine shoot moth, and white pine weevil.

A little-known insect, the white fir needle miner, previously restricted to parts of southern Utah, appeared in outbreak numbers in fir stands of the central Sierra Nevada mountains in California and in northern Arizona. Surveys are being intensified to delineate areas of infestations and to determine whether or not there is need for control.

Disease Control

Again in 1966, white pine blister rust control was the major forest disease control program. Systematic sampling surveys were conducted on 2 million acres in the valuable five-needled pine-producing areas of the Nation to determine the status of the disease, control needs, and the best control method for protection of each stand. A total of 5 million gooseberry and currant plants were either removed by hand pulling or sprayed with herbicides on 222,000 acres to prevent spread of the disease. To save infected white pines in Michigan, New York, Oregon, and Wisconsin, blister rust cankers were pruned or excised from 570,389 trees. Control has been established and maintained on 90 percent of the 17 million acres in the East and Lake States. The large problem area continued to be the 1.5 million acres of western white pine still to be protected.

Dwarfmistletoe control work was performed on National Forest lands in Arizona, California, Colorado, Montana, New Mexico, Oregon, and Utah. A total of 80,650 infested trees were cut or pruned on 29,870 acres. To assure a future stand of trees free from dwarfmistletoe on the Sleeping Child burn area of the Bitterroot National Forest, all the infested living lodgepole pine trees were cut on 11,250 acres. Plans were made to begin a study of silvicultural control of dwarfmistletoe in ponderosa pine stands in the Ochoco National Forest in Oregon.

Oak wilt control was carried on through Federal-State cooperative efforts in Pennsylvania, Virginia, and West Virginia, and detection surveys were made in Kentucky and Arkansas. A total of 32 million acres were covered by aerial surveys and 3,928 infected trees were destroyed to eliminate sources of inoculum. Postcontrol appraisal studies sponsored by the Forest Service to evaluate the Pennsylvania and West Virginia methods of control were continued with the aid of these cooperating States.

Stumps were treated on small acreages in National Forests in California and West Virginia to prevent the spread of *Fomes annosus*. A study of ash dieback was started in the Allegheny National Forest in Pennsylvania to learn more about the progression of this malady.

A survey was conducted in the Lake States to determine the distribution and intensity of Scleroderris pine canker on National Forest land. The disease, caused by the fungus *Scleroderris lagerbergii* Gremmen, has a long history of injuries to young pine plantations and nurseries in Europe. Twenty ranger districts in four Lake States National Forests with 2- to 10-year-old red and jack pine plantations were surveyed for the disease.

The survey results showed that Scleroderris pine canker is widespread over the Ottawa and Hiawatha National Forests in the Upper Peninsula of Michigan, and the Nicolet and Chequamegon National Forests in northern Wisconsin. The disease is killing trees on all 20 ranger districts where red or jack pine has been planted since 1955. Sixty-seven percent of the 176 red pine plantations and 86 percent of the 14 jack pine plantations sampled were infected. Mortality averaged 40 percent and 36 percent, respectively.

Other Control Activities

Efforts to find substitutes for the efficient but persistent chlorinated hydrocarbons were continued. Whenever possible, substitute materials were used for control even though more costly and less effective. A number of pilot tests of promising, less persistent pesticides were conducted. Biological and mechanical controls were used when feasible. Parasites that attack the larch casebearer have been reared and released annually since 1964. This year 260,000 were released in 39 localities in eastern Washington, northern Idaho, and Montana. Plastic sheeting was used in New Mexico to cover slash piles for control of ips.

Early detection and sound evaluation are keys to the prevention of pest outbreaks and heavy losses. Detection surveys are being expanded on the National Forests and on State and private lands so that outbreaks will be discovered and suppressed when they are small, thus avoiding devastating outbreaks and large control programs. In 1966 three additional States joined this cooperative effort. The Forest Service now participates with 23 States in a program to share costs of forest insect and disease control on non-Federal lands. These cooperating States and the National Forests contain 66 percent of the commercial forest land in the Nation. More vigilance, along with ever-improving survey methods and sampling techniques, will eventually reduce sharply the need for large forest pest control programs.

COOPERATIVE FOREST FIRE CONTROL

Forest Fire Damage Up Sharply

As of July 1966, 473 million acres of the 519 million acres of State and privately owned forest and nonforest watershed land was being protected under section 2 of the Clarke-McNary Act. Reports for 1966 show an increase in both the number of fires and acres burned on State and private protected lands in comparison with figures for 1965. In 1965, 91,495 fires burned 1,205,966 acres of protected State and private land. Figures for calendar year 1966 show a total of 98,157 fires burning 1,908,236 acres of protected lands. This is an increase of 6,662 fires and 702,270 acres in the protected acreage burned.

Extreme fire danger prevailed in the South and Southeast during April. Almost 400,000 acres burned during this short period. In the western half of the United States extreme fire danger occurred during July and August, and over 40,000 acres burned in 10 project-size fires. Colorado, Wyoming, and South Dakota reported the worst fire season in many years.

Arizona is No. 50

On July 1, Arizona became the 50th State to join the Forest Service in the CM–2 fire control program. About 2.7 million acres of State and private lands in Arizona will be brought under protection. The State Legislature also created the positions of State Forester and Deputy State Forester. Every State now has a State Forester.

Planning and Training Projects

The program of assistance in specialized administrative management analysis and comprehensive long range forestry planning has been expanded to several States.

The revised fire damage appraisal system has been adopted for use by the National Association of State Foresters. A series of meetings was held to train State and Forest Service field employees in the new system. This was a joint effort of the State Foresters, Forest Service Research, and State and Private Forestry.

The pilot Rural Fire Defense Training Project conducted in Colorado, Kentucky, Oregon, Missouri, and Florida was completed in June.

COOPERATIVE FOREST FIRE PREVENTION

Highlights of 1966 Smokey Bear Campaign

Smokey Bear and his ABC's was the theme of a float that won the Grand Marshal's trophy in the 1966 Rose Parade in Pasadena, Calif. Thanksgiving Day was "Smokey Bear Day on NBC–TV," with a 59-foot Smokey Bear balloon in the Macy's Parade in the morning and an hour-long animated musical in the evening. Both the balloon and the "Fantasy Hour Special" were sponsored by the General Electric Co.

Awards

Golden Smokey statuettes were approved by the CFFP Executive Committee for presentation to the National Zoological Park (caretakers of the "live Smokey" and of Mrs. Smokey), and to Ideal Toy Corporation (licensee for Smokey Bear dolls, games, etc. since 1953). Also approved were Smokey Bear Plaque awards to the Texas Forestry Association, Lufkin, Tex., for promotion of the "Keep Texas Green" program; to Oswald G. Casanova, prosecuting attorney, Iron County, Mich., for vigorous law enforcement of forest fire laws resulting in marked reduction of railroad fires; to Warren Chandler, announcer, Station KLZ–TV, Denver, Colo., for extraordinary services in publicizing forest fire prevention; and to Mrs. Mary Lea Griggs, owner of Tomolla Tree Farm, Sumner, Wash., for outstanding service in forest fire prevention education. In awards received, CFFP's 1-minute television spot "Family Tree" won the top prize in its category in the 1966 competition put on by the National Committee on Films for Safety.

Commercial Support

Approximately 45 licenses for use of the Smokey Bear symbol are now in effect. Royalties and fees received from licensees in fiscal year 1966 amounted to $43,046.33, up $12,000 over fiscal year 1965. Among the newly licensed items are a clock; a book, "Letters to Smokey Bear"; a silver charm, record album, sweatshirt, and songbook.

COOPERATIVE FOREST MANAGEMENT

Through the Cooperative Forest Management program, the Federal Government shares with the States the cost of assisting private woodland owners, loggers, and processors of primary forest products. The program provides technical guidance in multiple use management of woodland resources. Owners are encouraged and assisted not

only to make the best use of their opportunities to grow timber and other forest crops, but also to make the best use of their woodlands for other compatible and complementary purposes. Loggers and others harvesting forest products are assisted in improving their methods and equipment. Processors are assisted in improving their efficiency, the quality of their products, and their markets.

Benefits are expressed in terms of increased volume of quality timber grown and harvested; recreation for profit and for personal pleasure; water for farms, communities, and industries; forage for livestock; wildlife; decorative plant materials; edible fruits and nuts; and a reservoir of resources for future needs.

In fiscal year 1966, the Federal share in financing this program was $3,535,000 and the States' share $4,259,000. During the year, 759 service foresters employed by 49 cooperating States and Puerto Rico assisted 105,000 woodland owners. This involved 6,553,000 acres, or 2.2 percent of the Nation's acreage of privately owned small forests. Gross returns to the owners of these woodlands from the sale of forest products amounted to $22,574,000. Nine thousand eight hundred small forest products operators and processors also were assisted. The program helped to create an estimated 3.3 million man-days of employment in rural areas.

General Forestry Assistance

The Forest Service, through its GFA program, provides professional services to expand markets for forest products in support of RAD and to improve forest management, harvesting, and processing practices. The General Forestry Assistance program supplements the cooperative State-Federal forestry programs for State, local, and private forest lands, and forest products industry. Many USDA and other Federal programs relate directly to forestry and require professional services in a wide variety of disciplines at national, regional, State, and local levels. General Forestry Assistance personnel provide professional forestry services to States, other USDA agencies, to other Federal departments and to large private owners and forest industries when the States are unable to do so.

In fiscal year 1966, General Forestry Assistance personnel helped large private and industrial forest owners through service provided during 1,920 calls, which involved 42 million acres of forest land. Similar help was given State and local public land managers; this involved 328 calls affecting 16.5 million acres of forest land. GFA personnel made 634 calls helping consultants, organizations, and development groups to manage and improve 1 million acres. Help to other Federal agencies involved 102 service calls and 18.5 million acres.

During the year, GFA personnel prepared 121 forestry publications and 16 movie and slide series; actively participated in 72 research and administrative studies and 23 State Forestry long-range plans and workload analyses; participated in 213 forestry workshops and program development meetings; provided special services to 196 Rural Areas Development Committees, Technical Action Panels, and Forestry Cooperative Advisory Groups; and serviced 96 special Departmental forestry loan, study, training, and development projects.

Forestry Cooperatives

A special effort was made during the year to implement the USDA program for forestry cooperatives to improve the management, harvesting, processing, and marketing practices on small private forest lands and in small processing plants. Forestry Cooperative Advisory Groups were established in 30 States. These groups, with assistance from Regional and Area Offices and the USDA Committee on Forestry Cooperatives, provided technical assistance in the development of five forestry cooperatives. Shooting for a movie on forestry cooperatives was completed and three publications were prepared and distributed nationwide.

Other Cooperative Projects

The Forest Service furnishes specialized professional assistance on forest products, forest management and protection, forest industries, forest-based recreation and other forest land uses to the Departments of Commerce, Defense, Health, Education and Welfare, Labor, and State. In fiscal year 1966, the Forest Service investigated, reviewed, assisted and reported on 21 Manpower Development and Training Act proposals; 41 Economic Development Act industrial loans and technical feasibility grants; 38 Economic Opportunity Act projects; 8 Vocational Education Act projects; 16 Regional and District Development projects; and 46 natural beauty projects. These activities, together with other Forest Service activities in Rural Areas Development, contribute to the social and economic improvement of rural people and their communities.

Utilization and Marketing Services

The Utilization and Marketing program of the Forest Service has progressed steadily during the year. There are now 66 U&M generalists and specialists employed in the program. The Forest Service employs 24 of these people directly and shares the cost of employment of the remaining 42, who work for State Foresters in 31 States.

Training and retraining U&M personnel continues to be a major objective of the program. To properly assess training needed, a national conference was attended by 40 persons with a broad knowledge of the utilization and marketing fields. Representatives from industry, trade associations, States, universities, and Extension Service joined

Forest Service personnel from the Forest Products Laboratory, Regions, Stations and several Washington Office divisions to focus their experience and talents on training needs for utilization and marketing personnel. Recommendations of the group formed the basis for the training plans in the publication "S&PF Training in Utilization and Marketing."

Building on the basic wood technology course conducted in 1965, 30 Forest Service and State utilization and marketing technologists completed a 3-week course in wood products processing and marketing this year at Michigan State University. This training has stimulated several men to obtain further academic training in this field.

Tree Planting Remains High

Forest and shelterbelt tree planting on State and privately owned lands has averaged over 1 million acres annually for the past several years. Over 85 percent of this planting was on privately owned land. Forest products industries planted about 50 percent of this acreage on lands owned by forest industries (mainly lumber and pulp companies). Forty-eight State forestry agencies (all except Alaska and Arizona) continued to cooperate in the production, procurement, and distribution of planting stock through provisions of section 4 of the Clarke-McNary Act of 1924. Ninety-eight State-owned nurseries provided over 500 million small trees of the approximately 850 million needed. Forest industries produced 140 million small trees at their 26 nurseries. This was less than half of the stock needed to plant the 450,000 acres they planted. Small commercial nurseries provided over 50 million small trees, used mainly for planting Christmas trees and for shelterbelts in the Great Plains States. Other small public nurseries provided the additional stock needed.

Most of the tree planting on privately owned land was done in the following 11 States:

Acres Planted on Privately Owned Land

State	Industry owned	Other privately owned	Total
Florida	100, 890	24, 299	125, 189
Georgia	81, 293	26, 482	107, 775
Alabama	42, 191	25, 926	68, 117
Mississippi	21, 293	41, 195	62, 488
Virginia	35, 430	25, 212	60, 642
Oregon	48, 883	3, 997	52, 880
South Carolina	30, 384	20, 816	51, 200
North Carolina	27, 986	18, 344	46, 330
Pennsylvania	24, 170	21, 892	46, 062
Louisiana	32, 712	5, 777	38, 489
Washington	27, 416	5, 090	32, 506
Total	472, 648	219, 030	691, 678

State and private forestry interests have greatly increased their forest tree improvement activities. These include hybrids, propagating selected strains, and the planting of seed orchards and seed production areas. According to current reports, the States have established 164 seed orchards and seed production areas on 3,084 acres while forest industries have 164 seed orchards and seed production areas on 4,773 acres. This activity is expected to expand rapidly during the next decade. Increased timber growth and quality will result from these important developments.

The acreage direct seeded by hand, machines, or airplanes has declined in the past few years. In 1966, 124,652 acres were reforested on State and privately owned lands through direct seeding methods.

Assistance to the States in tree planting under title IV of the 1956 Agricultural Act has made valuable contributions to the reforestation programs on State-owned forests and to the States for tree improvement work. Thirty-five States participate in this program. It contributes to the planting of about 90,000 acres annually; however, several States concentrate their efforts on the development of improved forest tree seeds.

THE NATIONAL FOREST SYSTEM.

The Forest Service is responsible for managing, developing, and protecting 186 million acres of land and its resources in the National Forest System. This includes 154 National Forests in 39 States and Puerto Rico, containing 182 million acres; 3.8 million acres of National Grasslands; and 160,000 acres of land utilization projects. Under multiple use and sustained yield, these lands are administered for their five basic resources: Outdoor recreation, range, timber, water, and wildlife.

National Forest Management and Protection

On March 1, 1966, the U.S. Treasury received the two billionth dollar from receipts of the National Forests. This income from the use of publicly owned natural resources is but one of the many benefits realized in the management of the National Forests by the Forest Service, U.S. Department of Agriculture. These lands have provided a wide variety of outdoor recreation, available to every American. They have become known in every region for their fine hunting and fishing. And literally hundreds of communities and major cities depend on National Forest watersheds for clean, dependable sources of water.

Two billion dollars is a lot of money, but it is more than that. It is timber sold and harvested under the careful management of trained foresters—National Forest Rangers and Supervisors. In fiscal year 1966, the harvest was a record 12.1 billion board feet that brought in $164.9 million or 95 percent of total Forest Service receipts for that year. In addition, the receipts represent fees from livestock grazing on the public range; commercial developments for public recreation, such as ski resorts and lodges; and many types of special uses that are blended together in the multiple use of the National Forests.

It took 53 years for the National Forests to earn their first billion dollars in receipts—from 1905 to 1958. They brought in the second billion within only 7 years, thanks primarily to the ever-increasing demand for natural resources and to the stronger management that makes those resources more readily available. In the years ahead, the demand for National Forest resources will increase even more rapidly. Under the current Development Program for the National Forests, solid planning and intensive management are preparing these "Lands of Many Uses" to meet the resource demands of a growing America.

While there are many uses of the National Forests, they are all tied together under a comprehensive, coordinated multiple use plan. Whether the administrative unit be an entire region or a Ranger District, it is managed according to a plan that takes into account an inventory of natural resources, measurement of public demands, and critical factors of sustained yield capacity, timing, and coordinated patterns of use. This type of planning and management puts into practical operation the concepts of decades of Forest Service management and the directives of the Multiple Use-Sustained Yield Act of 1960.

TIMBER MANAGEMENT

Timber Sales

A record high volume of timber was harvested from the National Forests for the fourth consecutive year. During fiscal year 1966, 12.14 billion board feet of timber was cut—900 million board feet more than in 1965. The record harvest resulted in a new high for timber receipts deposited in the Treasury. Timber receipts amounted to $164.9 million, an increase of $26.1 million over fiscal year 1965 and an amount larger than total Forest Service receipts from all sources in any prior fiscal year.

A volume of 11.4 billion board feet of timber was sold in 23,923 sales. In addition, over 850,000 Chirstmas trees and numerous other forest products, such as boughs, cones, seedlings, were sold in 56,922 sales. A total of 80,845 sales were made in fiscal year 1966 compared with 87,491 in 1965.

In addition to the volume of timber harvested for which a charge was made, 180.6 million board feet of timber valued at $265,141 was granted at no charge to over 99,100 individuals under the Secretary's Free Use Regulations, S–26 and S–27.

The Divisions of Timber Management and Budget and Finance worked with a private con-

tractor to develop automated procedures for the timber sale accounting system. Pilot trials of the automated procedures are scheduled for fiscal year 1967 on selected National Forests in Regions 1, 4, 5, and 6.

Progress in harvesting the allowable annual cut under multiple use-sustained yield management for the past 5 years is shown in the following table:

Fiscal year	Annual allowable cut [1]	Actual volume cut	Percent of allowable cut harvested	Actual volume sold	Percent of allowable cut sold
	Billion bd. ft.	*Billion bd. ft.*	*Pct.*	*Billion bd. ft.*	*Pct.*
1962	10. 5	9. 0	86	10. 3	98
1963	11. 3	10. 0	88	12. 2	108
1964	12. 0	11. 0	92	11. 7	98
1965	12. 0	11. 2	93	11. 5	96
1966	11. 9	12. 1	102	11. 4	96

[1] *As of January 1 preceding the fiscal year.* Annual allowable cut includes only sawtimber for National Forests west of the Great Plains and in Alaska, and sawtimber and convertible products for National Forests in the eastern half of the United States.

Timber Inventories and Plans

New management plans were approved for 22 working circles during fiscal year 1966. These plans covered 9,046,000 acres of commercial forest land. The Division of Timber Management has developed and installed procedures which fully automate management plan records.

Reforestation and Timber Stand Improvement

Major reforestation and timber stand improvement accomplishments in fiscal year 1966 are shown in the following table:

Type of work	Financed from—		Total
	Forest land management appropriation	Deposits by timber purchasers	
	Acres	*Acres*	*Acres*
Planted	95, 033	100, 876	195, 909
Seeded	19, 567	19, 652	39, 219
Natural regeneration on prepared sites	10, 979	40, 112	51, 091
Total reforestation	125, 579	160, 640	286, 219
Release	114, 136	152, 946	267, 082
Thinning	69, 218	76, 600	145, 818
Pruning	4, 573	5, 194	9, 767
Total T.S.I.	187, 927	234, 740	422, 667

Fourteen Forest Service nurseries produced 98,851,000 trees and 23,805,000 more were grown at State nurseries for planting on National Forest land.

Forest Service extractories processed 45,674 pounds of clean tree seed from cones purchased largely from local people. An additional 41,329 pounds of clean seed were purchased from tree seed companies.

Two hundred ninety-six acres of seed orchards and 341 acres of seed production areas were established. Work continued on selection and testing of trees for superior genetic qualities and the grafting of approved selections in seed orchards.

Thinning operations were mostly in young conifer stands. Release operations were carried on in young hardwood stands and in young conifer stands overtopped by brush.

In addition to accomplishments shown in the tabulation, 151,435 acres were burned over as a stand improvement measure to control undesirable species in the understory of southern pine stands. Also, 24,671 acres were burned to protect longleaf pine reproduction from brown spot disease, and 16,359 acres were burned to remove needle litter and competition so as to create a favorable seedbed for natural regeneration. Work performed by the Job Corps in the National Forests accounted for an additional 1,697 acres planted, 15 acres seeded, 186 acres of site preparation, 693 acres of release, 1,687 acres of thinning, and 587 acres of pruning.

RANGE MANAGEMENT

National Forests and National Grasslands are major producers of forage for livestock. Some 20,000 farm and ranch operations graze 6.7 million head of cattle and sheep under permit on these public ranges. This resource use involves 105 million acres of Forest Service lands in 11,600 grazing allotments, and is administered as one of the many National Forest resource uses through coordinated plans for multiple use management.

During 1966, new 10-year permits were issued to most of the livestock operations that use the National Forest ranges. This assures continued stability to an important part of the agricultural economy that is dependent on the National Forests. This stability extends to other areas of American agriculture, since more than 1 million calves and 2 million lambs are raised on these public rangelands annually, and many are shipped to crop-producing areas for added weight and finishing.

Interagency Cooperation

The Forest Service and the Farmers Home Administration in 1966 completed a Memorandum of Understanding that sets the stage for a new era of cooperative planning and action. The memorandum provides for coordination of agency responsibilities and functions when a grazing association operates on National Forest System lands and also receives financial assistance from the Farmers Home Administration. The agreement permits rural groups to pool their resources for the efficient management of integrated public and private land areas. It also provides for technical

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assistance to these groups and for programs of sound range conservation and management.

Range Allotment Analysis

The program of range analysis moved ahead with the systematic collection of physical information on range and related resources on 605 range allotments. This information furnishes the basis for evaluating management objectives and alternatives. The most appropriate management alternative was selected for each allotment based on multiple use principles and cost-benefit effectiveness. A management plan was prepared for each allotment setting forth the means for attaining the specific objectives selected.

A direct result of the range analysis work is the bringing of 1,000 additional allotments under intensive range management—making the total 4,000 allotments so managed. By 1980, the Forest Service hopes to achieve intensive management on all 11,600 allotments.

Permittees in particular are recognizing the benefits of intensive management. Grazing associations and individual livestock growers in growing numbers are cooperating with the Forest Service in management and development programs, often offering to share the cost of needed improvements. Some of the positive results of these cooperative efforts have been illustrated in the Forest Service motion picture, "Ranchers and Rangers."

Basic to Forest Service programs of range improvement is the construction of physical structures, fences, and water developments, or range revegetation where such action is needed. Much of this work and subsequent maintenance is done in cooperation with the permittees. During the year 205,000 acres of depleted rangelands were revegetated with forage plants for livestock and game animals. Since the revegetation program was started, an aggregate of 2.2 million acres have been rehabilitated. The Forest Service constructed with appropriated funds 1,077 miles of fence, 1,113 water developments, and 171 other improvements. In addition, 353 miles of fence, 414 water developments, and 91 other improvements were constructed by cooperating permittees. In cooperation with permittees, the Forest Service maintained 57,000 miles of fences, 40,000 water developments, 5,400 miles of stock trails, and 7,400 other improvements.

Range Management in the South

A program of positive range management is moving ahead in the South. Although many local people were at first apprehensive about grazing regulation, they are beginning to recognize the benefits from efficient use of range resources and the greater stability offered to small farm operations. Forest Service officers have continued intensive efforts to inform people about the program, with the result that they are receiving an increasing number of applications for grazing permits. In 1966, 300 new permits were issued, and 80 new range allotments were established.

Grazing Fees and Receipts

Grazing fees in 1966 ranged from 10 cents to $1.68 per animal-month for cattle, and from 4 cents to 39 cents for sheep. Receipts from these fees amounted to $3,860,498.

The Forest Service and Utah State University have completed a cooperative study of grazing values and fees in the National Forests of Utah. Using the State as a pilot area, this project applied the results of previous studies, and developed computer programs to determine values, fee levels, and fee areas in the National Forests.

During the year, the Forest Service and the Bureau of Land Management jointly engaged the Statistical Reporting Service to conduct a major data collection project on the cost of public and private grazing land use. The information was needed as a basis for determining grazing values and evaluating current fee structures of 98 National Forests, 19 National Grasslands, and 55 Grazing Districts of the Bureau of Land Management. During September, October, and November some 10,000 individuals were interviewed in the Western States, including permittees who use Forest Service or Bureau of Land Management rangelands, and ranchers who lease private grazing lands. The Statistical Reporting Service will summarize the data and turn it over to the two agencies for further analysis and a reevaluation of fee structures.

WATERSHED MANAGEMENT

Lands in the National Forest System are important as water producing areas. The National Forests shelter the headwaters of many major rivers, and in the West they yield roughly one-half the water available for farm, domestic, and industrial use. In addition, they help to prevent sedimentation of streams and reservoirs.

The Forest Service is putting new emphasis on action to meet more adequately the Nation's water needs. During the year this involved work on water quality and water yield improvement, and studies aimed at determining the ultimate effect of watershed programs on the whole environment.

The Forest Service is participating in the evaluation of demands for non-National Forest water use in comparison with the total supply, and in the western Regions is assessing long-term National Forest needs on a watershed basis. Hydrologic analyses provide the data needed to judge existing and potential water yield capacity.

Restoring Damaged Watersheds

Projects on the Malheur National Forest in Oregon and the Jefferson National Forest in Virginia show how damaged watershed areas can be restored to productive use. On the Middle Fork of the John Day River in Oregon, the Forest Serv-

ice regraded tailings from gold dredging operations of the 1930's. The area was then seeded to range grasses and fenced to regulate livestock grazing; thus, a series of waste piles have been transformed into attractive and productive mountain meadows. In Virginia, the Forest Service stabilized and revegetated spoil banks and haul roads from former manganese mining operations. This has improved fish and wildlife habitat, enhanced water quality, and harmonized the disturbed area with the surrounding landscape.

On some 700 other projects during fiscal year 1966, Forest Service crews stabilized 50,000 acres of sheet erosion and otherwise deteriorated areas. They treated more than 1,000 miles of eroding streambanks, shorelines, and gullies. Three hundred projects stabilized erosion on 4,275 miles of abandoned roads and trails.

Soil Surveys

Standard soil surveys supply the information needed to coordinate National Forest resource management and development activities with the capacities of the wide variety of soils encountered. This kind of work can greatly reduce or eliminate the damage caused by soil disturbance. During the fiscal year, standard soil surveys were completed on 2.7 million acres. Supplementing standard surveys were reconnaissance surveys for selected management needs and special-purpose hydrologic surveys that were completed on 2 million acres.

Forest Service-Public Health Service Water Study

Late in 1965 the Forest Service and the Public Health Service began a cooperative study of water quality in streams of the Pacific Northwest. In an effort to determine the relationship between type and intensity of land use and the quality of water in streams, the two agencies have completed preliminary investigations and have established field installations on three watersheds in Oregon and Washington. The characteristics of these watersheds are: Heavy multiple use on the Clackamas River, moderate multiple use with light recreation activity on the Green River (water supply to Tacoma), and heavy logging activity with negligible recreation on the Cedar River (water supply to Seattle).

Impact Surveys

Whenever reservoirs or other water resource development projects are planned on lands within or adjacent to the National Forests, the Forest Service prepares impact surveys and submits reports to define the effects of the projects on National Forest protection and management. The reports also reflect the contributions that these lands can make to the project purposes. The surveys and reports help make the construction agency (such as Corps of Engineers or Bureau of Reclamation) during the preliminary planning phase, and during construction a Forest Service liaison officer works directly with the construction agency. The Forest Service objective in this work is to protect the land and resources, to minimize interference with regular protection and management, to benefit from new management opportunities, and to help construction agency operations. During fiscal year 1966 the Forest Service prepared surveys and/or provided liaison on 227 projects.

On water development projects within and adjacent to National Forest System lands, the Forest Service administers public recreation facilities in cooperation with construction agencies. During the fiscal year facilities were provided at seven separate projects.

The full development of these water resource projects often calls for specifically prescribed treatment of tributary National Forest watersheds; in most cases the purpose of such treatment is to reduce siltation, to increase water yields or improve water quality, or to enhance scenic beauty and other natural values affecting public use. Land treatment measures were applied during the year on three separate projects.

Strip Mine Surveys

The Forest Service cooperated in a nationwide study of problems associated with strip and surface mining, and the reclamation of affected lands. In fiscal year 1966 the Forest Service made a random sampling survey and analyzed the data; this provided information on the present conditions of surface-mined areas and the characteristics of the land and its uses, much of which was used in the July 1, 1966, interim report to the Appalachian Regional Commission on strip and surface mining. The report found that 90 percent of the area adjoining strip-mined land in Appalachia is in forest or idle land reverting to forest. About 96 percent of the surface areas disturbed by coal strip mining are in private holdings.

Mining Claims

Determination of surface rights under Public Law 84–167 began in 1956, and is now approaching completion. However, on-the-ground examination of nearly 2,300 claims on 22 million acres still remains to be done. As of July 1, 1966, over 114 million acres had been examined. The validity of 2,033 claims, amounting to 50,000 acres, has been recognized. About 1,000 claims are yet to be examined to complete the complex and difficult task. The following table shows progress over the last 2 years and the estimated accomplishments for fiscal years 1967 and 1968:

Year	Acres examined	Claims examined	Asserted rights valid	
			Claims	Acres [1]
1965	6, 636, 900	1, 246	147	2, 940
1966	4, 795, 600	1, 169	111	2, 220
1967 (est.)	6, 000, 000	1, 200	130	2, 600
1968 (est.)	6, 000, 000	1, 200	130	2, 600

[1] Computed using 20 acres per claim.

Petitions filed under Public Law 87–851, the Mining Claim Occupancy Act, as of January 1, 1966, resulted in examinations to determine the validity of 164 mining claims in 40 National Forests. Of 154 applications filed, 83 applicants were found to be qualified and 40 unqualified. The Bureau of Land Management rejected 31 applications. Fee simple title was offered in 15 cases. Thirty were offered life estate and one applicant was offered a limited tenure lease. A total of 60 cases have been consummated under the act.

Mineral Permits and Leases

There are over 17,000 mineral leases and permits on 15 million acres within the National Forest System. Mining and prospecting permits issued and administered directly by the Forest Service during fiscal year 1966 covered nearly ¾ million acres, including some 1,040 permits for common varieties of mineral materials, and nearly 1,100 permits for borrow pits for highways and construction purposes. On National Forest System acquired lands, total revenues from mineral leasing and oil and gas exploration and development amounted to $3,752,760 for fiscal year 1966. In addition, an estimated $16 to $20 million in revenues was received from rents and royalties for leases on National Forests and National Grasslands reserved from the public domain.

Two significant leases were recently negotiated with International Nickel Co. to mine copper, nickel, and associated minerals from approximately 5,100 acres in the Superior National Forest, Minn. If the initial exploration and development of metallurgical processes proves economically feasible, it will provide an economic boon to the community of Ely and to northern Minnesota, which will suffer with the expected closing of the Pioneer Mine. Special provisions have been included for the protection of soil, water, recreation resources, and natural beauty.

There are 140 active mining operations on acquired National Forest lands in which the owner retained mineral rights when the land was purchased by the Government.

OUTDOOR RECREATION

New Facilities

As recreation use spirals upward on the National Forests, it is matched by a continuing demand for all types of recreation facilities. Much of the recreation on the National Forests is dispersed, and uses only the roads, trails, streams, woodlands, and beautiful scenery. However, other activities such as camping, picnicking, boating, swimming, and winter sports require developed sites where the health, safety, and enjoyment of visitors can be assured. To accommodate the increasing number of visitors, the Forest Service developed 325 new campgrounds and picnic sites during the fiscal year. Each site normally includes grouping of facilities such as tables and benches, fire grates, parking spots, trash containers, tent spots for camping areas, and water and sanitary facilities. With a planned capacity of four or five persons for each facility grouping, National Forest campgrounds and picnic areas can accommodate safely about 478,000 persons at one time.

Facility groupings for camping are generally spaced three or four per acre in groups of 15 to 30. The following table shows the increase in the number and capacity of campgrounds and picnic sites during the fiscal year.

CAMPGROUNDS AND PICNIC SITES

	June 30, 1965	*June 30, 1966*	*Increase, 1965–66*
Number of developed sites	7, 229	7, 554	325
Area occupied (acres)	41, 044	42, 344	1, 300
Capacity, persons at one time (PAOT):			
Camping (PAOT)	326, 884	373, 080	[1] 46, 196
Picnicking (PAOT)	98, 411	105, 608	[1] 7, 197
Total, camping and picknicking (PAOT)	425, 295	478, 688	[1] 53, 393
Family groups (5 persons) which can be accommodated	80, 485	95, 737	[1] 15, 252

[1] Includes expansion of established sites.

Other Developments

While camp and picnic areas are the more familiar type of National Forest recreation development, other areas also require intensive development. These include ski and winter sports areas, organization camps, resorts, swimming sites, boat docks, and the like. These are installed or improved with appropriated funds, or by private capital as authorized by special use permits, under which individuals or business organizations develop sites for public use and pay an equitable fee for the privilege of using public sites. The increase in accommodations at these areas is shown below.

WINTER SPORTS FACILITIES

	June 30, 1965	*June 30, 1966*	*Net change*
Number of developed sites	199	197	−2
Area under permit (acres)	45, 987	60, 135	14, 148
Capacity at one time (persons)	269, 082	303, 375	34, 293
Uphill devices and jumps:			
Chair lifts	158	178	20
Gondolas	8	8	0
Platter pulls	72	85	13
T-bars	71	83	12
Rope tows	307	271	−36
Ski jumps	48	33	−15
Total	664	658	−6

SPECIAL FACILITIES

	June 30, 1965	June 30, 1966	Net change
Organization camps	573	587	14
Hotels, lodges, resorts	406	417	11
Commercial public service sites	202	167	−35
Swimming sites	237	249	12
Boating sites	571	615	44
Observation viewpoints	315	371	56
Total	2,302	2,406	104

The Forest Service issued a preliminary permit to Walt Disney Productions to develop a year-round recreation area at Mineral King in the Sequoia National Forest in California. The planned investment will total some $35 million and will be the largest single outlay of private capital ever to be made on National Forest land for recreation purposes.

Overall Recreation Use

In 1965 the Forest Service began using a new unit of measurement for recording recreation use of the National Forests and National Grasslands. This is the visitor-day, adopted by all Federal agencies for uniform reporting of recreation use to the Bureau of Outdoor Recreation. One visitor-day is equivalent to an aggregate of 12 person hours of recreation activity.

In 1966 the Forest Service estimated 151 million visitor-days of use on National Forest System lands. The 1965 figure was 160 million visitor-days. These figures do not represent an actual reduction in use; rather they reflect more intensive standards of measurement. The 1965 figure was produced from site-by-site estimates, augmented by individual site sampling on less than 10 percent of the National Forests. For the 1966 figure, we had the benefit of one or more statistically sampled sites on 124 National Forests. Estimates of recreation use will be further improved as more sites are calibrated.

All evidence shows that recreation use continues to expand and that overuse of facilities remains a serious problem. Recreation specialists feel that estimates for recent years would describe a trend of increasing outdoor recreation use if the same standards of measurement had been consistently used.

Recreation Information Management

Since 1965 the Forest Service has been developing a data management system to help cope with the need for increasingly comprehensive information about the recreation resources of the National Forests. This is the Recreation Information Management (RIM) program. Still in the development phase, it was about 50 percent operational at the end of calendar year 1966. It is computer-oriented and organized to provide output which provides ties to management of other National Forest resources.

The system provides for collection, analysis, storage, and retrieval of data on all recreation sites and areas of the National Forest System, including their biological and physical characteristics and condition, their capacity, and the volume and kinds of use they support.

Five basic groups of data will be managed for each component of the recreation resource:

1. Inventory
   a. Site or area location, description, and condition
   b. Facilities and improvements: number, type, location, and condition
2. Plans and management program relationships
3. The nature and location of construction, maintenance, and administrative needs
4. Measurement, analysis, reporting, and projection of recreation use
5. Biological-physical relationships

Wilderness

Steady progress was made throughout 1966 in implementing the Wilderness Act of 1964 as it applies to National Forests.

Secretary of Agriculture's regulations governing National Forest Wildernesses and Primitive Areas were promulgated on June 3, 1966. Immediately thereafter, the issuing of administrative guidelines, as supplements to the Forest Service Manual, was started. This job is now almost complete. Forest Supervisors have been working on management plans for each Wilderness, with a goal of having them completed by July 1, 1967.

Review of National Forest Primitive Areas in accordance with the requirements of the Wilderness Act is moving forward. Public hearings were held on eight proposals during 1966, and three more are scheduled for early 1967. The President has recommended to Congress establishment of the San Rafael Wilderness, Los Padres National Forest, Calif., consisting of 142,722 acres of National Forest land. A total of 12 Primitive Areas will have been studied and considered at public hearings by July 1, 1967.

Visitor Information Service

The Visitor Information Service program has just completed its first 5 years. This is an on-the-ground activity which provides a more meaningful experience to the National Forest visitor through greater understanding of the National Forest and the natural environment.

The development of this program has proved to be most timely. Americans have shown a growing interest in conservation matters, and their interest is intensified when they come to the outdoor environment of the forest. Concurrently, our problems and opportunities to serve visitors have been intensified. The President's Natural Beauty program, the recently enacted Wilderness Act, the

Land and Water Conservation Fund Act, and the work of several commissions, such as the Lewis and Clark Trail Commission, and the establishment of National Recreation Areas are among the conservation programs that have generated a healthy interest in our Nation's natural resources.

This program has developed smoothly and has been well received by the public. We have learned that people go to the woods for something more than an outdoor adventure. In the forest, the visitor and his family explore new ideas, meanings, and values. Men and women of the Visitor Information Service help the visitor understand his relationship to the forest environment and to its conservation.

Last year an estimated 10 million visitors made use of the facilities and services provided. They made contact at visitor centers, at campfire programs, at small information or orientation stations, or along guided or self-guiding trails. They asked questions and received answers, and proved to be Americans who want to know their responsibilities in the conservation field.

The Forest Service plans to continue the orderly development of this visitor information program. We do not expect to blanket the entire National Forest System; rather, Forest Service officials have carefully selected key contact areas which will be developed to provide the most service for the dollar invested. This includes recognition of the responsibilities to economically depressed areas where recreation development can make a major contribution towards community improvement.

We will continue to emphasize the development of low-cost facilities such as interpretive trails, information stations, vistas, and story-board signs. These simple facilities, developed and manned by competent personnel, will meet the most urgent need. Occasionally there will be justification for establishing the more complex Visitor Information Centers, capable of accommodating large numbers of people in a short period of time.

The Visitor Information Service program is a positive way to meet the President's request for providing better service to the public.

Special Uses

National Forests and National Grasslands serve many other uses besides those related to renewable natural resources. These range from airport beacons to apiaries, from wayside stands to winter resorts involving some 80 different kinds of uses. Such developments are authorized by special use permits issued to individuals, business establishments, civic groups, and government agencies that operate them. These developments represent a total private investment on National Forest land of almost a billion dollars. The number of permits and the fees paid for them have been increasing steadily in recent years. The number of permits issued by or administered by the Forest Service continues to increase steadily—from 63,000 in 1965 to 64,000 in 1966. Receipts to the U.S. Treasury in fees from these permits totaled $2,556,242 during fiscal year 1966; an increase of $22,846 over fiscal year 1965.

A contract study was completed on rental fees charged both in and out of Government for use of land to support businesses that serve the vacationing public. Recommendations were developed for a new system of charging to be used by the Forest Service in assessing recreation special use permits. The recommendations were reviewed during the year and were generally accepted. Their result will be a new method of determining fees, which relates the value of sales to the investment as a basis for applying escalated rate schedules to several kinds of businesses. Some 1,700 business enterprises with a total investment of about $100 million on National Forest land are involved.

WILDLIFE MANAGEMENT

The Forest Service has been active in a new look at wildlife that has attracted much public interest—the management of rare and endangered species, and the protection of other forms of wildlife that add to man's enjoyment of the natural environment. Forest Service officers are assessing the status of threatened wildlife species on National Forest System lands and are developing habitat management plans aimed at insuring their survival. Examples of wildlife receiving or needing special attention are: the California condor, bald eagle, Kirtland's warbler, Puerto Rican parrot, Piute cutthroat trout, and Little Colorado spindace. This year the Forest Service released a new motion picture, "Patterns of the Wild," which emphasized the beauty, charm, and variety of forest wildlife.

Wetlands Development

While nearly all National Forests and National Grasslands have some opportunities for wetlands development, a few have a great potential for developing such areas to increase waterfowl, furbearers, fish and other wildlife. An outstanding example is the Chippewa National Forest in Minnesota, which has attracted national interest with the completion of an intensive wetland inventory and development proposal. In cooperation with the Bureau of Sport Fisheries and Wildlife and the Minnesota Department of Conservation, the National Forest has identified the various public benefits that would accrue from the development of its wetlands at a relatively low cost per acre. The Hiawatha National Forest in Michigan is planning a similar survey.

Wildlife Habitat Improvement

National Forests have a well-earned reputation for excellent big-game hunting, and continue to attract increasing numbers of hunters. As big-game hunting has increased, so has small-game hunting in National Forests. Even more people use these

lands for fishing. In response to this kind of pressure, the Forest Service must keep the streams, lakes, and wildlife habitats in condition for the continued production of healthy and abundant fish and game populations.

All of the National Forests have a backlog of habitat improvement jobs which would improve the production of wildlife. To get maximum benefits from a small budget, most of this habitat improvement is achieved through intensive coordinated planning with other resource activities. In addition, much progress is accomplished through cooperative work with State fish and game agencies.

The following habitat improvement work was completed on the National Forests in fiscal year 1966. About 60 percent of the total costs was paid by the States under cooperative programs.

Wildlife food and cover improvements:	
Seeding and planting forage	33,082 acres
Release of forage plants	18,141 acres
Prescribed burning	43,043 acres
Protecting key wildlife areas	39,507 acres
Permanent openings	5,947 acres
Small water developments for wildlife:	
Ponds, troughs, guzzlers, etc	1,052 items
Waterfowl wetland improvements	2,708 acres
Fish stream improvements:	
Channel structures	1,158 items
Spawnbed improvements	1,185 rods
Stream barrier removal	2,245 items
Protecting stream channels	17 miles
Rough fish removal	55 miles
Fish lake improvements:	
New fishing lakes	1,040 acres
Fish shelters and spawnbeds	244 items
Aquatic plant control	761 acres
Rough fish removal (mostly by nonchemical means under State programs)	52,852 acres

FIRE CONTROL

The 1966 fire season in the National Forests was one of the most severe in recent times. Bad burning conditions began early in many areas, and in much of the West they persisted into the fall. Spring and summer precipitation averaged less than 50 percent of normal in California, Nevada, southeastern Oregon, and southwestern Idaho; in some localities, it was the driest season on record. Critically dry fuel conditions caused many fires to spread rapidly in spite of prompt, energetic control efforts.

In the Southwest during May and June, dry fuel and lightning produced a 50-percent increase in the number of fires and a fourfold increase in the area burned, over the 5-year average. In California a plane crash in June started a major fire in a remote area of the Los Padres National Forest; it burned 93,000 acres before being brought under control.

During July, August, and early September, some 75 large fires destroyed timber and range lands in Forest Service protection areas across the Western States. Hardest hit were the critically dry forests of southern Idaho, which experienced more than two dozen fires over 100 acres in size during the season. One period of lightning activity north of Boise, Idaho, started more than 150 fires in 2 days early in September. Eastern Montana, Oregon, and northern California also had periods of extreme fire conditions with a number of large fires burning at one time.

Loop Fire Tragedy

Tragedy climaxed the fire season on November 1, when the Loop Fire Killed 10 members of the Forest Service's El Cariso Interregional Fire Crew near the boundary of the Angeles National Forest, Calif. Twelve others received critical to minor injuries, and one of these men died from injuries on November 6. The fire occurred in an area of steep terrain and highly inflammable brush. The fire crew was trapped by a sudden flareup in a narrow steep canyon. The fire jumped the canyon and traveled upslope 2,200 feet in less than 1 minute. A special Forest Service team studied the disaster and reported no evidence of negligence or carelessness. The team made specific recommendations for procedures to strengthen operations in this type of situation, and to insure that such accidents will not recur.

In all, 11,245 fires occurred within National Forest protection areas in 1966. The 5-year average (1961–65) is 11,743 fires per year. The area burned totaled 332,921 acres, reflecting the severe burning conditions. This is the largest area burned in any year since 1960, and more than doubled the 1961–65 annual average of 139,315 acres.

Fire Management

The application of scientific principles in forest fire management has done much to promote efficiency, safety, and economy in fire control work. Continuing analysis of current methods and needs is constantly developing better procedures and equipment.

Ten specialized fire suppression crews now do much of the backup to initial action. These mobile crews of 25 men each are stationed strategically in western regions and, along with trained Indian and Job Corps crews, were used extensively throughout the West during the busy 1966 fire season. They prevented many fires of 100 to 500 acres from getting larger.

A new aid to fire managers—the infrared mapping unit—became fully operational in 1966 and was used on 21 large fires. The airplane-mounted unit uses infrared scanning to locate and map fire perimeters and areas of intense burning. It is especially valuable in its ability to spot fires when smoke cover or darkness make normal reconnaissance impossible. By providing current information at critical times, it is extremely helpful in planning fire attack strategy.

Other new equipment items include a complete lightweight fire-camp outfit that can be transported by helicopter or parachuted into remote locations. A new power brush cutter operates more

safely and effectively than saws normally used. An improved belt-kit emergency fire shelter was used for the first time. Field tests were made of an improved hand-held heat detection probe to aid firefighters in locating hard-to-find, but potentially dangerous, hot spots when mopping up fires.

Forest Fire Prevention

Fire control efforts in recent years have emphasized the prevention work needed because greater public use of the National Forests increases fire risk. A new national prevention-action plan recognizes both on-the-ground and far-reaching preventive actions that must be taken by fire personnel and resource managers. It emphasizes the need for all fire agencies to work cooperatively in their prevention programs.

The helicopter proved to be a noteworthy aid in day-to-day prevention work. In areas of high man-caused fire occurrence, it provided a method of contacting widely dispersed forest visitors who otherwise would be missed.

Air Operations

Airplane patrols for forest fire detection have proved efficient and their use was expanded. Air detection not only is more flexible; it provides significant savings compared with a fixed ground lookout network. A new system of guaranteed payment for air tankers assures their availability when needed. Initial attack with air-dropped chemical retardants is now holding many fires to small size. Additional heliports and helispots have been developed as a link with ground attack for more efficient and economical firefighting. Favorable results from current tests of night use of helicopters for fighting forest fires may lead to limited night operations next fire season. Smokejumpers saw much action during the long fire season and halted numerous potentially serious back-country fires at small size.

Fire Control Training

Training at all levels is doing much to assure competent supervision and efficient, safe work in all fire control activities. During the year the progressive referral method in programed texts was adapted to fire training, and promises to save much of the cost of programed texts as well as make training more effective. This method refers the trainee progressively to explanatory materials when his knowledge is lacking, or to new subject matter as he is ready for it. Other training activities in 1966 included the production of a new film, "Fire vs. Fire," on the use of fire in firefighting. "The Fireman's Handbook" was revised and especially directed to single firemen and crew bosses. Seventy Forest Service and cooperating agency personnel were given training in advanced fire generalship at a national school.

ENGINEERING

Roads and Trails

The appearance of our highways is one of the most challenging design and management problems of our day. Our highways and forest roads must be useful, functional, economical, and safe. In addition, they should provide a pleasant experience for the users. Creative planning can make the forest view a real escape from the artificial environment man usually develops for himself. The landscape character of a road or highway can be developed or intensified by reducing the negative factors and accenting the attractive qualities.

The Division of Engineering is currently working on many facets of highway and highway facility design. These include: Sign criteria, roadside controls, bridges, culverts, and guard rails. The aim is to better relate the highway structure and its facilities to the environment and to esthetic considerations in land management. Criteria have been improved for the many types of signs such as those for entrances, recreation sites or areas, road directional, and interpretive uses. This will provide signs at lower cost through mass production methods, and will better inform the traveling public.

During 1966 the Forest Service began two new projects to improve the application of modern engineering technology to forest road and trail construction. These were the writing of computer system programs applicable to road design and the programing of road construction projects for computer use.

Obligations from forest road-and-trail authorizations for maintenance, flood repair, and construction amounted to $117.5 million and obligations from other miscellaneous sources amounted to $1.9 million. During fiscal year 1966 the Forest Service constructed or reconstructed 1,495.8 miles of roads, 667.6 miles of trails, and 212 bridges with regular appropriated funds. Timber purchasers, with some supplementation by the Government, constructed or improved an additional 4,294.4 miles of roads valued at $56,037,267. They provided maintenance on 15,430 miles of roads at an estimated cost of $9.2 million.

On June 30, 1966, the National Forests were served by a transportation system consisting of 189,975 miles of forest development roads, 102,744 miles of trails, and 422 landing fields for fixed-wing aircraft.

Buildings

Construction proceeded on 28 major buildings. These structures included seven buildings for Visitor Information Centers; 10 buildings for fire research; four tree nursery buildings; and seven fire and general purpose buildings. The total construction cost was approximately $11 million.

Construction on the Pinchot Institute for Conservation Studies at Milford, Pa., reached a stage

where its conservation-education work could get underway. Several minor construction projects are uncompleted, but the basic facilities are in place.

Numerous starts and completions were accomplished on smaller administrative site improvements costing less than $50,000 per building. These include small barracks, offices, mess halls, garage shops, and residences.

Equipment and Systems

To keep pace with the rapid advance of technology and its opportunities for improved equipment and systems, the Forest Service operates two equipment development centers and an electronics center. In collaboration with industry, these centers have developed and tested numerous new and improved items of equipment for forestry programs. Among the year's accomplishments were a gyroscopically stabilized cargo carrier for use on trails, capable of carrying 800- to 1,000-pound loads; an improved mechanized trail grader; and improvements in design and standardization of fire pumper-tanker trucks that reduce initial costs by $1,000, maintenance costs by 75 percent, and total lifetime costs for the 75 Forest Service units by $150,000. In collaboration with the National Park Service, Department of the Interior, the Forest Service tested 87 campground stoves and grills to determine their ability to withstand environmental factors and to assess their desirable features. Six of the 87 have been recommended for further consideration in the development of servicewide standards.

Equipment Management

The Department of Agriculture, General Services Administration, and Forest Service formed a Joint GSA–FS Motor Pooling Study Committee to study ways Interagency Motor Pools could be most effectively coordinated with the Forest Service fleet. This followed a recommendation in the "Review of Management Practices and Manpower Utilization in the Forest Service" report. After developing guidelines and study plans, the committee visited the Redding, Calif., area to investigate and analyze motor pooling problems. The study is being continued.

To improve fleet management and utilization, the Forest Service developed a fixed-ownership cost and variable-operating cost rate system, which is being tested in the Intermountain, California, and Eastern Regions.

During fiscal year 1966 the Service owned, operated, and maintained a fleet of 11,507 vehicles, 190 wheel tractors, 509 crawler tractors, 328 motor graders, 105 loaders, and thousands of other pieces of equipment in the regular Forest Service fleet, as well as 1,159 vehicles, 10 wheel tractors, 53 crawler tractors, 38 motor graders, 36 loaders, and other equipment at Job Corps Centers. Forest Service vehicles traveled over 99 million miles on the job of protection, management, and administration; and 7 million miles were traveled for Job Corps program activities.

Job Corps Conservation Centers

We expanded the capacity of seven Job Corps centers and completed construction of buildings for all 47 Job Corps Conservation Centers which the Forest Service operates for the Office of Economic Opportunity. Because these centers represent a considerable investment in physical facilities and are more complex than the normal Forest Service work center, we developed a special training program for maintenance technicians.

Water and Sanitation

The Forest Service has been working with the newly formed Water Pollution Control Administration in its appraisal of the pollution caused by some 18,000 sanitation systems at Forest Service field sites. A preliminary investigation indicates that about 15 percent of these sites will require corrective action to meet current water-pollution control standards. A more detailed survey and some preliminary designs for corrective action will be started this year. This corrective program should be completed in 3 to 5 years.

Property Corners and Lines

The Forest Service has over 281,000 miles of property lines controlled by more than 1,132,000 survey corners. Many of these lines and corners were established over 100 years ago. Due to time, the elements, and the actions of man, much survey evidence has disappeared. Since 1958 the Forest Service has been restoring these through a special program to locate and mark the property lines between lands in the National Forest System and adjoining lands owned by others. Also, we are making special efforts to protect and maintain existing property lines and survey corners.

In 1966, field search was made for 26,714 land survey corners; 15,172 corners were marked with durable corner monuments, and official records of this work were documented and recorded; 7,322 corners were determined by diligent ground search to be completely obliterated and lost. To reestablish lost corners requires expensive official cadastral surveys. During fiscal year 1966, through cooperative funding arrangements, the Bureau of Land Management surveyed 452 miles of line and established or reestablished 1,021 corners for the Forest Service.

A total of 1,443 miles of property lines were located and marked to program standard in calendar year 1966. An additional 809 miles of line were marked to interim standard for immediate administrative use. These lines can be brought to full standard without additional retracement surveys.

Surveys and Maps

For effective National Forest management, the Forest Service has a basic need for mapping of 638,580 square miles. Complete map coverage of

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our National Forests and Grasslands is still lacking, but map production is steadily increasing. In fiscal year 1966, the Forest Service produced planimetric maps covering 21,821 square miles and topographic maps of 2,097 square miles, bringing total coverage to 66 percent and 44 percent respectively. Over 1,000 specialized maps were prepared by field offices for timber sales, site plans, and other localized needs. Over 125 road projects were studied or designed by modern photogrammetric techniques.

The use of aerial photography for resource management continues. This year photography of 29,062 square miles, scale 1:15,840, and 4,672 square miles at larger scales were obtained at a total cost of $147,298.

LANDS

A major handicap to the management of many National Forests is the complex pattern of non-Federal land ownerships intermingled with National Forest lands. In the East, only about half the land within National Forest boundaries is federally owned. Even in the West, where the Forest Service administers about 90 percent of the area within National Forest boundaries, ownership patterns create many management problems.

In nearly every National Forest, the Forest Service seeks to adjust the pattern of landownership through purchases and exchanges, most of which are voluntary agreements between the Government and private citizens or corporations. These transactions are approved by the National Forest Reservation Commission for acquisitions under the Weeks Law and certain related authorities, and by the Forest Service when they are executed under other authorities.

A total of 459 tracts involving 183,857 acres were approved for purchase in 1966. These included the first two purchases, containing 60,171 acres, in the newly established Redbird Purchase Unit in eastern Kentucky. This unit was established on the mountainous headwaters of the South Fork of the Kentucky River as a part of the Appalachia program. The area has produced many major floods, causing millions of dollars of damage downstream.

Also included were 211 tracts totaling 92,036 acres to be acquired through the Land and Water Conservation Fund established by Public Law 88–578, approved Sept. 3, 1965. These lands have outstanding values for intensive recreation development, hunting, fishing, hiking, swimming, boating, wilderness enjoyment, and other recreation pursuits. Some 233 cases, totaling 30,595 acres, involved routine Weeks Law purchases of lands needed for consolidation of the Government's ownership for more effective resource management.

Seventeen donations totaling 489 acres were accepted during 1966. These donations came from public-spirited individuals, States, counties, and school districts desiring to place this land under Forest Service multiple-use management.

One hundred and thirty-five land exchanges were approved. In these exchanges, when consummated, the United States will receive 141,277 acres and will grant 120,115 acres; and, in a few cases, cutting rights to certain National Forest timber selected by the proponents. Completion of these exchanges will reduce the need for property lines location and monumentation by 1,200 miles, reduce road construction by 114 miles, eliminate the need for 156 right-of-way cases, and reduce special-use permits and occupancy trespass by about 182 cases. These items eliminate anticipated operational costs of more than $5 million over the next 10 years.

Authority to acquire scenic easements within the National Forest System was implemented for the first time. This new program, when fully developed, will permit protection of natural beauty, further enhancing recreation enjoyment of the National Forests.

Completion of transactions during the year (not identical to the number of cases approved) produced the following changes in lands administered by the Forest Service:

	Acres
Total area administered by Forest Service (owned by the United States), June 30, 1965	186, 364, 185
Increases:	
Purchased	29, 845
Conveyed to the United States in exchange	166, 190
Donated to the United States	489
Transferred from other Federal agencies	51, 870
Reserved from public domain	5, 890
Recomputations and adjustments due to status checks, net increase	45, 216
Total	299, 500
Reductions:	
Conveyed by the United States in exchange	148, 651
Grants, sales, reconveyances, mining patents, homesteads, etc	10, 802
Transferred to other Federal agencies	6, 722
Eliminated from National Forests and returned to public domain status	500
Total	166, 675
Net increase	132, 825
Total area administered by Forest Service (owned by the United States) June 30, 1966	186, 497, 010

Road Rights-of-Way

Rights-of-way are acquired for forest development roads which provide public access for use and enjoyment of the National Forests. During fiscal year 1966, 1,415 rights-of-way for 1,701 miles of proposed and existing roads were obtained.

In addition, cooperative agreements are made with private landowners for joint construction and use of roads which serve areas of intermingled

private and National Forest lands. Forty-seven such agreements covering 413 miles of road costing $5 million were consummated.

Special Areas

The Mount Rogers National Recreation Area in the Jefferson National Forest, Va., was added to the growing list of projects specially designated by Congress for outdoor recreational development, for the enhancement of scenic beauty, and the compatible use of other resources. In the heart of the area is 5,720-foot Mount Rogers, the highest point in Virginia, and nearby White Top and Pine Mountains. The area totals 154,000 acres, of which 84,000 are owned by the United States. The new National Recreation Area offers magnificent mountain scenery, spacious natural environment, and many opportunities for camping, picnicking, hiking, riding, and hunting. There are large expanses of "sods" or grassy clearing, remnant glacial front forests of Fraser fir and red spruce, and northern hardwood timber stands. Under the authorizing legislation, the Forest Service will manage the Mount Rogers National Recreation Area as a part of the Jefferson National Forest.

The Federal Interdepartmental Task Force studying the Potomac River Basin found that lands in the vicinity of the forks of the Shenandoah River in Virginia have a high potential for public use of scenic and recreation resources. Task force recommendations for further study have caused the Forest Service to make an intensive analysis of possibilities for correlating management of the Massanutten Mountain area of the George Washington National Forest with a program to protect scenic, recreation, and wildlife values along the North and South Forks of the Shenandoah River adjacent to the National Forest. Other areas are receiving similar attention concerning the role of an expanded and more highly developed National Forest System toward making the Potomac Basin a model of conservation.

Transfers of federally owned lands to and from the National Forest System continued. At several Bureau of Reclamation Reservoirs, lands were given National Forest status subject to their continued use for reclamation purposes by the Department of the Interior. These transfers were made pursuant to Public Law 89–72.

In New Mexico, about 57,000 acres of public domain lands were given National Forest status under authority of the act of June 9, 1962. These former private lands within the National Forests had been acquired in exchanges for other public lands administered by the Bureau of Land Management under the Taylor Grazing Act. They were not situated for effective administration by the Bureau, but were well located for National Forest administration.

In Montana, an isolated 28,000-acre tract was eliminated from the Lewis and Clark National Forest and transferred to the administration of the Bureau of Land Management. This is the Little Rocky Mountains unit, which is largely surrounded by other public domain lands, also administered by the Bureau. Elsewhere in Montana, 38,600 acres in scattered and isolated tracts of public domain were added to several nearby National Forests. The rearrangements in jurisdiction of these federally owned lands will permit more economical and effective land management programs.

The boundaries of the Arapaho National Forest in Colorado were extended by Public Law 89–446, approved June 11, 1966, to include public domain and City of Denver lands at Dillon Reservoir. This major impoundment, constructed by the city, is located on the Blue River in a beautiful mountain setting and has a high value for public recreation. The law consolidates all Federal land at the reservoir under Forest Service management. Single-agency development of the recreational potential was considered the most economical and practical. To further consolidate recreation management, the act authorized cooperative agreements with the City of Denver whereby the Forest Service would manage city lands adjacent to the reservoir. Fishing will be permitted, but not swimming or water skiing.

On April 11, 1966, President Johnson renamed the Cumberland National Forest in Kentucky as the Daniel Boone National Forest. This action, by Proclamation 3715, culminated a popular effort led by the Governor and many prominent citizens to honor thus the pioneer whose life was closely associated with the area in and around the National Forest.

FORESTRY RESEARCH is carried on by the Forest Service at its eight regional Experiment Stations, the national Forest Products Laboratory, the Washington Office, the Institute of Tropical Forestry, and with cooperating universities. Scientists study the growth and harvesting of timber; protection of forests from fire, insects, and disease; management of rangelands and wildlife habitat; outdoor recreation; protection and management of watersheds; efficient and economical utilization of forest products; and forest economics. A continuing forest survey provides comprehensive information on the extent and conditions of forest lands, the volume and quality of timber resources, trends in timber growth and harvests, and the outlook for future supplies and demands.

Forestry Progress Through Reseach

An insect parasite, tested and evaluated in the East, has been shipped and is being reared in the West for use against the destructive larch casebearer. An insect pathogen, the bacterium *Bacillus thuringiensis,* promises to be a significant control agent against the gypsy moth. And five species of insect predators of the balsam woolly aphid have been successfully established.

Insect outbreaks are eventually checked in nature by the increased activities of natural enemies of the insect such as parasites, predators, and specific microbial diseases. Taking a hint from this natural phenomenon, research is seeking to introduce biological agents that are destructive to particular pests. The process is slow, but an effective biological control will prove cheaper, safer, and longer lasting than conventional methods.

This is one of the many new methods being explored or used to cut down on the huge annual timber losses due to forest pest activities. Others include the use of sex attractants as a trapping tool to estimate insect population or to lure them to destruction; breeding trees that are resistant to insects and diseases; modifying cultural practices in forest management; developing nonpersistent insecticides that are toxic only to the organism under attack; and using remote-sensing techniques that reveal potential pest flareups before they become epidemic.

FOREST PRODUCTS UTILIZATION RESEARCH

Flashover of Combustible Gases

Recent fire research at the Forest Service's Forest Products Laboratory has provided a new insight into how fire progresses in buildings. The findings may serve to promote the greater acceptability of wood and other combustible materials. Heretofore, the sudden leaping of flames—called flashover—was thought to be spontaneous ignition of combustibles with rising temperatures. Current evidence is that fire progresses by flashovers as hot combustible gases reach new sources of oxygen, regardless of the combustibility of wall and floor covering materials.

Lignin Formation

Forest Products Laboratory experiments were successful in partially duplicating nature's process by which the living tree uses simple chemical compounds derived from the soil and air to produce lignin, the complex compound that binds wood cells together. These experiments contributed greatly to further understanding the nature and behavior of lignin as it exists in the living tree. They added another steppingstone to improved pulping techniques, better solutions to the waste problem, and new uses of this abundant product of nature.

Determining Multiproduct Potential in Standing Timber

The Forest Service has developed a promising inventory technique for determining suitability and potential yields and value of timber for products other than lumber—for example, poles, pulpwood, or veneer. Subjective estimates by field men are eliminated. Data on basic tree characteristics can be reanalyzed to meet any one of several inventory needs. Resource management agencies will save money and manpower by (1) making maximum use of a single set of data and (2) eliminating need for reinventories.

Wood-Stringer Bridges

Forest Service laboratory and field studies of forest-road bridges led to a recommendation to the American Association of State Highway Officials for a change in design criteria. For maximum efficiency and economy, interior stringer sizes may be reduced without changing the existing design basis for outside stringers. A saving of as much as 25 percent in the volume of bridge timbers is possible where shear is the limiting factor.

Pulpwood Chip Storage

Production of pulp chips from sawmill and veneer mill residues has increased rapidly in recent years. In 1963 it amounted to 11 million cords, or one-fourth of all pulpwood consumed at U.S. mills in that year. Economic advantages in the transport, storage, and handling of chips are attractive in comparison to roundwood if pulp yields and quality are not sacrificed during chip storage. Forest Service research showed that in kraft pulping, pile storage of pine chips presents no problem except for some loss in yield of tall oil and turpentine. However, hardwood chips show different reactions. In maple, birch, and beech chip piles, the common wood-rotting fungi find satisfactory growth conditions in the cooler portions of the pile. They cause loss in wood substance, loss of wood extractives, and discoloration of the chips. A definite decrease was found in sulfite pulp yield and in pulp brightness. Now, with the problem identified, further research to control the fungi or to minimize their harmful effects will be feasible.

Paneling and Flooring From Low-Grade Hardwood Logs

Forest Products Laboratory studies showed that wood cut from small, low-grade red oak logs can now be press-dried in a few hours by a process that greatly enhances color and appearance. This new drying system uses the concept of going directly from logs to products instead of first sawing lumber that must be remanufactured. Low-quality wood with knots and other defects can be used for paneling and flooring. No installation allowance for shrinkage is necessary, and side- and end-matched panels and flooring can be installed with only a few carpenter's tools. This product would be especially appropriate in the Northeast, North Central, and Appalachian regions where vast quantities of little-used hardwood timber are available. The processing technique eliminates costly steps in production, reduces waste, utilizes local machines and labor, and provides an attractive product from low-quality logs. The product value at the mill can be expected to be $5 to $15 per thousand board feet higher than that of conventional products.

New Housing System

From 2 by 4's, boards, plywood, and other common building materials, a new construction system for modern homes has been developed by the Forest Products Laboratory. The roof system utilizes a new type of truss and plastic-covered plywood-lumber roof sheathing; walls have wide-spaced double 2 by 4's, and thermal-sound insulation; interior finish is of gypsum reinforced with low-grade boards; sheathing is combined with exterior siding. The system will help lower costs and improve house quality. Only conventional materials are used. The new concept will use relatively low-cost and plentiful grades of lumber and yet provide for the construction of high-quality homes using the latest advances in technology.

FOREST ENGINEERING RESEARCH

Design System for Aerial Cableways

Analyses of aerial logging cableway operations indicated a need for an easily applied method of designing and operating a single and multispan skyline. Such a method has been devised and results presented in "Skyline Logging Handbook on Wire Rope Tensions and Deflections." Use of the handbook should result in more efficient and safer skylines, and in the layout of timber sales suitable for skyline harvesting. More use of aerial systems is urgently needed to gain difficult access, and to protect watershed and esthetic values. It represents an important step in realizing the multimillion dollar annual benefits resulting from reduced road mileages and added timber supplies.

Cutting Actions of Chain Saw Teeth

A method has been developed for measuring the energy consumed and the horizontal, vertical, and tangential forces on a single chain saw tooth cutting through green timber. This research breakthrough, long sought, is expected to lead to design of improved chain saw teeth and other cutting devices. The potential benefits are large. It is estimated that only a 10 percent reduction in the cost of chain saw parts replacement and maintenance would save industry $1.85 million annually.

TIMBER MANAGEMENT RESEARCH

Acid Paste and Gum Production Costs

The naval stores industry could save $5 million each year from the use of sulfuric acid paste. The paste is better than the water solution of acid now used to stimulate the flow of gum. Chipping labor costs can be cut as much as $4 per barrel of gum. Better grades of gum, worth $2 to $4 more per barrel, are recovered because acid contamination is reduced. Prolonged flow of gum requires larger cups, but collection intervals are lengthened to 4 weeks. The result is an additional cost saving up to $2 per barrel.

Harvesting and Nutrient Losses

In the Southeast, one cord (5,000 pounds) of loblolly pine pulpwood contains 0.25 pound of phosphorus, 1.52 pounds of potassium, 1.69

pounds of calcium, 0.56 pound of magnesium, and 1.44 pounds of nitrogen, or a total of 5.46 pounds of these nutrients. The harvest of several successive crops of trees, it was found, could result in mineral nutrient deficiencies in poorer soils.

Peatland Productivity

Black spruce in Minnesota bogs grew fastest along channels of flowing water. These "water tracks" support a great variety of bog plants. The more distant "muskegs" have fewer species and slower tree growth. Chemical analyses showed that "water tracks" carry nutrients into the bog from mineral soils, but "muskegs" have no source of nutrient replenishment except rain.

Size of Openings and Hardwoods

Different management systems were compared in Appalachian hardwoods in West Virginia. When trees were harvested singly to maintain a continuous forest cover, the proportion of sugar maple increased while the proportion of yellow-poplar, red oak, and black cherry decreased. Thus, species composition can be controlled by varying the size of openings made in harvest cuts. These findings indicate the degree of flexibility possible in managing forests for several uses.

Nursery Temperatures and Seedlings

Night temperature in the nursery influences the vigor of ponderosa pine seedling roots. In California ponderosa pine transplants from a nursery with warm nights produced more and longer roots than transplants from another nursery with cold nights. Nights warmer than 40° F., but 19° to 26° C. cooler than day temperatures, gave the greatest root production. This day-night temperature difference may prove to be important in selecting nursery sites for ponderosa pine.

Mill Effluent To Irrigate Pines

Three years of study in Louisiana showed that papermill effluent may safely be used to irrigate pines. If strong wastes are avoided, as much as 20 to 40 area inches of effluent can be disposed of in this way. Trees benefit, and a major source of pollution is kept out of streams.

Jack Pines and Needle Cast Fungus

Jack pines differ in susceptibility to a needle cast fungus, *Hypodermella ampla*. After 10 growing seasons, 29 seed sources from northeastern Minnesota had only about 25 percent infection. Trees from a lower Michigan source showed 95 percent infection. Since these differences remain constant from year to year and from environment to environment, they are genetically controlled. Selected trees from these seed-source tests provide geneticists with breeding material to develop strains of jack pine resistant to the needle-cast fungus.

Studies in Straight-Grained Sweetgums

The most obvious fault of sweetgum for lumber manufacture is the warping thought to be related to "interlocked grain." Studies of 225 sweetgums growing in seven southeastern States indicate that this undesirable feature of sweetgum may be genetically controlled. Thus, choosing straight-grained seed parents may eliminate troublesome problems in processing sweetgum lumber and veneer.

FOREST RECREATION RESEARCH

Campsite Damage

Minnesota's Boundary Waters Canoe Area had 250,000 visits in 1965. On the area's thin and fragile soils even lightly used campsites lost 50 to 99 percent of their ground cover. Tree reproduction on these sites is absent; erosion, compaction, and root exposure are prevalent. Interviews with canoeists show that most of them have little or no knowledge of soil and plant capabilities, and do not realize they are damaging the sites used for camping. Several information programs have been suggested that would include the fundamentals of forest ecology and encourage dispersed use to reduce site impacts.

Recreation Sites and Plant Survival

A Utah study showed that fertilization increased the vigor of campground vegetation, especially if nutrients previously lacking were supplied. Trees were helped when fertilizer was placed in holes drilled in the soil at the root zone rather than broadcasting. Timing of watering is very important. Watering just before heavy use may soften soils, make vegetation turgid, and increase the possibility of damage. Watering after heavy use, however, can aid survival by keeping bruised vegetation moist until it has a chance to heal.

Although trees compete with ground cover for moisture and nutrients, they also control the amount of direct sunlight reaching the forest floor. Bruised plants have little chance of recovering if they dry out before healing. Arranging recreation layouts to take advantage of shade may substantially increase the survival of heavily trampled ground cover. A related study showed that vegetation survival was greater when recreation use was frequent but fairly light, rather than infrequent but heavy.

Programs for Children and Adults

Most campers in lower Michigan National Forests are family groups who stay about 5 days. This suggests the need for variety in visitor information programs from day to day. About three-fourths of the children are of preschool and elementary school age. The opportunity and need to interest and inform adults cannot be met by pitching all information programs at a child's level of understanding. One possible answer is to aim daytime presentations at children and night presentations at adults.

Users of Privately Owned Campgrounds

Profitable private campground operation depends much upon how well the owner anticipates the facilities and services wanted by campers, his estimate of the potential market, and his understanding of the kinds of campers he hopes to serve. Recent studies of private forest campground users in the Ohio River Valley show that most of them generally camp as family groups. For many, this was their first year of camping. The majority came from urban areas. Families camping out for just a weekend usually camped with another family, participated in several other outdoor activities, traveled less than 100 miles to the campground, and used either a travel trailer or tent trailer. Families camping while on a major vacation tended to camp alone, participated in very few other outdoor activities, had often traveled more than 100 miles to the campground, used a tent more often than any other type of shelter, and were more interested in conveniences such as showers and laundry facilities than were the weekend campers.

INTERNATIONAL FORESTRY ACTIVITIES

The international forestry activities of the Forest Service involve training and technical assistance in foreign aid programs, exchange of information in meetings of international organizations, the translation of important scientific documents, and the preparation of forest resources reports for specified areas of the world.

Training Foreign Nationals

The Foreign Training Unit prepared or assisted in the preparation of 138 training programs or study tours for 412 foreign nationals from 66 countries. In addition, one refresher program was prepared for an employee of the Agency for International Development in the United States for home leave and reassignment.

Of the 138 programs, 64 were sponsored by the Agency for International Development and included a total of 189 participants. Twenty-one programs for 27 participants were sponsored by the Food and Agriculture Organization of the United Nations. The remaining 53 programs, involving 196 participants, were sponsored by the individuals themselves, by their employers and governments, by international foundations, and by the U.S. Department of State through its educational and cultural exchange programs.

Of the total 412 participants, 102 came to the United States under individual programs and 310 came as members of 26 teams for short courses. These included the tropical forestry short course at the Institute of Tropical Forestry, the youth leadership training course, the short course in administration of national parks and equivalent reserves, and two separate short courses in multiple use forest management for two teams of Turkish foresters.

One hundred sixty-two participants were from countries in Asia, the Middle East, and Pacific islands; 109 from Europe and Canada; 74 from Latin-American nations; and 67 from Africa. In 1966, 49 foreign nationals were assigned to various U.S. colleges and universities for academic training in forestry and related fields. This brought the total current academic enrollment of foreign nationals programed by the Foreign Training Unit to 89.

Technical Consultation and Support

All types of activities that provided assistance to foreign governments increased during the past year. A total of 864 requests from 61 countries were received and filled. These covered (1) advice on technical forestry problems, (2) procurement of seed, (3) supply of technical publications and training films, (4) procurement of specialized equipment and supplies, and (5) testing of wood samples.

On Oct. 1, 1966, 95 U.S. foresters were serving on long-term assignments (over 6 months) in 40 foreign countries, as compared with 57 in 27 countries a year earlier. This increase has occurred despite a reduction in the number serving on direct-hire with the Agency for International Development (AID): only 31 foresters are now employed directly by the AID. However, 54 foresters are assigned to projects sponsored by the Food and Agriculture Organization (FAO) of the United Nations, and the United Nations Development Program (formerly the U.N. Special Fund). The remaining seven are serving overseas with universities, the Organization of American States, the supervisory staff of the Peace Corps, the Forest Service under Participating Agency Service Agreements (PASA), and the Departments of Interior and Defense.

Also, during the year, 23 foresters had short-term assignments (6 months or less) in 15 countries.

The Latin American Training Aids Center, located in Mexico and sponsored by AID, has translated and printed in Spanish several Forest Service technical publications; these have been distributed to schools, industries, and individuals through the AID missions located in the Central and South American countries. A similar project is underway at the Training Aids Center located in Paris, where several Forest Service publications will be translated into French and printed for use in the French-speaking countries of Africa and the Far East.

A collection of over 800 colored slides, illustrating forest conditions and problems in 15 countries, was assembled. These are available for use in orienting men to be assigned to these countries, and as illustrative material for publications and speeches.

The Chief participated in a special mission to Vietnam to study forest conditions there and to

plan an AID-sponsored USDA program to develop Vietnam's forest resources.

International Organization Activities

The Sixth World Forestry Congress was held in Madrid, Spain, in June. Attended by 2,800 foresters and associates from 93 countries, with about 375 from the United States, it was the largest international forestry meeting ever held. Its theme was "The Role of Forestry in the Changing World Economy." The 18-man official U.S. delegation was headed by Chief Edward P. Cliff. Dr. R. E. McArdle, former Chief of the Forest Service, was an Honorary President, and a considerable number of other U.S. foresters were prominent in the Congress.

Forest Service representatives attended seven other important international conferences: (1) the Second World Land Reform Conference in Rome, Italy; (2) the Tenth International Grasslands Conference in Helsinki, Finland; (3) the FAO/ECE Timber Committee in Geneva, Switzerland; (4) the Eleventh Pacific Science Congress in Tokyo, Japan; (5) the Tenth Technical Meeting of the International Union for the Conservation of Nature and Natural Resources in Lucerne, Switzerland; (6) meeting of the Forestry Committee of the Organization for Economic Cooperation and Development in Paris, France; and (7) a range development meeting of the Central Treaty Organization in Peshewar, Pakistan.

Translation Services

Approximately 5,810 pages of scientific and technical publications were translated into English under the Special Foreign Currency Science Program. An additional 820 pages were translated through a service provided by the U.S. Department of Commerce. Publications to be translated were selected by the Forest and Range Experiment Stations and the Forest Products Laboratory.

Copies of all translations were distributed to the Stations, the Laboratory, the Institute of Tropical Forestry, and the National Agricultural Library. This translation service has been offered to schools of forestry through the Committee for the Advancement of Forestry Education, Society of American Foresters. Four forestry schools have signed the necessary cooperative agreements.

World Forestry Resources

The World Forestry Resources Unit, in addition to preparing special reports for a contracting agency, served as a source of information regarding forest resources and forest products industries in foreign countries, answering more than 130 requests from other Forest Service divisions, other Government agencies, industry, educational institutions, and private individuals.

FOREST ECONOMICS AND MARKETING RESEARCH

Research and Higher Sawmill Profits

Decisions on how to saw different classes of logs for maximum profit are based on (1) the amount, quality, and cost of logs, (2) possible sawing patterns and their yields, (3) time available on each piece of mill equipment, and (4) markets and prices. These factors were considered simultaneously in analyzing the operations of a high-speed southern pine sawmill. Batches of logs of varying diameter, grade, density, and location in the tree were processed by several sawing patterns into different product mixes. Inputs, outputs, and time required for each operation were measured. Optimum pattern for each class of logs was then determined by linear programing.

Sawing each class of logs by its optimum pattern yielded $1,647 total revenue per hour above raw material cost. This revenue came from 31.5 thousand board feet of lumber, 2.3 thousand board feet of timbers, and 38.5 tons of chips. The analysis also showed how changes in operating procedure, such as increasing the log supply, selling logs for pulpwood, changing lumber sales strategy, purchasing low-grade lumber, adding equipment, and changing relative prices of boards and dimension would change the optimum sawing pattern for each class of logs. The system of analyses developed in this study can be used by many sawmill operators as an aid in making better management decisions.

Demand and Supply Situation

During the past decade U.S. consumption of hardwood veneer and plywood has about doubled. Most of the increase in demand has been supplied by imports from Japan, the Philippines, and Southeast Asia. Projections of prospective future consumption show a continued increase in demand for hardwood veneer and plywood in fine furniture, paneling, and related products.

The part of these additional demands which will be supplied from domestic timber depends on the management of hardwood forest resources. Projections of timber demand, growth, and inventories point to major timber supply problems. Over the next few decades, substantial declines in tree size and quality are to be expected if timber cut and growth continue recent trends and management remains at present levels.

Through investments in timber management programs, it would be possible in time to grow the kinds and qualities of hardwood timber needed for the low-cost production of veneer and plywood. The forest lands owned by farmers and miscellaneous small private owners would be of key importance in any such program. They include about four-fifths of the commercial hardwood forest and about three-fourths of the inventory of hardwood sawtimber.

New Data and Guides on Red Pine

Thinning practices and rotation ages are major determinants of returns on timber-growing investments. Recently developed data for red pine in the Lake States demonstrate that under most conditions investment returns are highest if red pine stands are thinned regularly to 90 square feet of basal area per acre. Data also were developed to show how financial rotations, which must be estimated in evaluating thinning alternatives, are affected by stand conditions, investment alternatives, costs, and prices. Application of these findings on the several million acres of red pine in the East would add substantially to long-run sawtimber supplies. Possible increases in timber output from improved thinning practices would also have the effect of reducing costs of growing red pine by $1 to $2 per thousand board feet.

Related guides describe how to estimate present values of incomes and costs in growing red pine trees for sale as pulpwood or sawtimber, and how to calculate expectation values and rates of return for a wide range of timber-growing conditions. Applicable to any type of ownership, the guides also illustrate how to compare investment opportunities in growing red pine; how to determine the amount one can afford to invest to buy land, establish and maintain a stand, or pay in annual taxes or other expenses; and how to estimate the cost of producing stumpage under specified conditions.

Timber Outlook for Pacific Northwest

The forest lands of Washington, Oregon, Idaho, and western Montana contain 1,123 billion board feet of sawtimber—about 44 percent of the U.S. supply. In 1962, timber industries in this region consumed about 21.2 billion board feet (International ¼-inch log rule) of timber in producing about 51 percent of the Nation's softwood lumber, 87 percent of the softwood plywood, and 25 percent of the woodpulp. Projections of future timber supplies indicate that timber consumption will increase to 25 billion board feet by 1985, or 22 percent above 1962. Woodpulp production is projected to rise about 2.4 times and softwood plywood 1.7 times. Lumber production, however, is expected to remain about the same as in 1962.

With increased output per man-hour, employment in the timber-based industries is projected to drop from about 158,000 workers in 1962 to 145,000 in 1985. Employment in the sawmill industry is expected to fall from about 56,000 to 31,000, but employment in the other timber-based industries is expected to increase with growth in production.

F.S. Log Grades Increase Returns

A study at five Appalachian hardwood sawmills showed that local log grading systems misclassified 42 percent of the volume in 1,164 sample logs. As a result, operators underpaid suppliers for some logs and overpaid for others. Average net returns to the five mills could have been increased nearly $4 per thousand board feet through use of more accurate standard Forest Service log grades. A related study at 13 sample mills showed that Forest Service log grades can be readily applied by the log scaler at an average cost of less than 30 cents per thousand board feet of logs. The study also showed that one man was more efficient than a two-man scaling and grading crew.

Forestry Investments in Depressed Areas

There are extensive areas in the United States such as Appalachia where timber capital has been seriously depleted. In these areas there is particular need for objective methods of rating the potential efficiency of investments in forest rehabilitation and development. A study has provided an economic model for approximating the potential investment efficiency of selected wood-growing alternatives on several economic-condition classes of forest land in a section of the Cumberland Plateau in Tennessee. Results of the study indicate that most of the forest land in these counties is capable of returning 3 percent or more on investments in forest development. Increases in timber production also would provide much-needed employment and income.

Production Potentials in Southern Illinois

A recent analysis of markets, wood supplies, production costs, and other factors shows a potential for a substantial increase in pulp and paper production in southern Illinois. Available timber could sustain additional pulping capacity of 1,500 to 2,500 tons per day. Water supplies and rates of flow of major rivers are adequate for most pulping processes; transportation, labor, and power are available at reasonable cost. Cost comparisons of pulp and paper production and shipment among important manufacturing regions of the United States suggest that Illinois mills could compete with mills in other regions for markets in the Midwest and Middle Atlantic States.

RANGE AND WILDLIFE HABITAT RESEARCH

Increased Beef Production

Livestock must receive concentrate supplements or have access to improved pasture in connection with efficient use of forest range in the Southeast Coastal Plain. To evaluate various programs for providing improved pasture in the spring-summer grazing period, tests were made involving forest range, improved pasture, and combinations of the two. Annual calf production was 325 pounds per cow on native range (with a high level of fall-winter feeding) and 376 pounds per cow on improved pasture. These results enable landowners to select a productive spring-summer grazing program which can be adjusted to their ranch situation. Where controlled winter burning of native forest range is compatible with other land uses, burned range is a cheap source of much valuable spring feed which can be integrated with the range-improved pasture program employed.

Native Vegetation Improves

Grass production on rangelands in western Colorado increased almost as much under improved management as on areas that were not grazed for 19 years. After many years of close grazing, grasses produced 162 pounds per acre or only 18 percent of the total herbage in 1941–42. (Weeds and browse produced the remaining 82 percent.) By 1960, with lighter grazing, grasses comprised 39 percent of the vegetation and produced 300 pounds per acre versus 353 pounds per acre on the ungrazed range. Essentially there was no difference in the relative percentage of grasses, forbs, and shrubs on the two areas. However, conspicuous changes in the species of grass herbage occurred during the period, particularly on ungrazed range. Slender wheatgrass (*Agropyron trachycaulum*), brome grasses (*Bromus* spp.) and trisetum (*Trisetum* spp.) accounted for 63 percent of the grass herbage after 19 years as compared with 14 percent initially. In contrast, Letterman needlegrass (*Stipa lettermanii*), sedges (*Carex* spp.) and bluegrasses (*Poa* spp.) contributed 65 percent at the beginning but only 27 percent at the end. Similar but smaller changes occurred under the restricted grazing.

Herbarium Provides Field Assistance

From 3,900 plant specimens which were identified for field personnel in 1966, approximately 3,000 were added to the Forest Service herbarium as part of a continuing effort to provide reliable identification of the complex flora of the many range plant communities. This "working" herbarium now contains nearly 140,000 annotated specimens from all parts of the United States. Based partly on the information collected, a publication, "Notes on Western Range Forbs—*Cruciferae* through *Compositae*" (Agriculture Handbook No. 293), was issued. This well-illustrated volume provides descriptions, characteristics, distribution, and forage value of 470 important plants and will be an invaluable tool in range and wildlife habitat research and management.

Sulfur Application Increases Grazing Capacity

Grazing capacity is increased by applying sulfur or sulfur plus nitrogen on annual range at the San Joaquin Experimental Range in California. Sixty pounds of sulfur per acre, which may be economically applied by helicopter, increased grazing capacity as much as 46 percent on summer-fall "dry season" range and 82 percent on winter-spring "green season" range. Sulfur plus 80 pounds of nitrogen increased grazing capacity more than 140 percent; however, this treatment was four times more expensive than the use of sulfur alone.

Habitat for Cattle, Deer, and Elk

Deer, elk, and cattle each use differently the openings and the adjacent spruce-fir and ponderosa pine forests of Arizona. Counts of accumulated droppings of each class of animal showed that cattle made more use of openings than adjacent spruce-fir forest, elk grazed about equally in the forest and the openings, and deer preferred the forest borders. Cattle made more use of natural than created openings in contrast to deer and elk. Openings larger than 20 acres were used very little by deer and elk except near their forest borders. In the more open ponderosa pine forests, deer used the forest and the openings about equally, but elk and cattle used the openings more than the forests. The greatest use by elk and cattle was in areas where perennial grasses were most abundant, while deer use was heaviest where forbs were abundant. Although cattle used all sizes of openings with about equal selectivity, deer and elk preferred openings less than 1,600 feet in diameter. In coordinating timber cutting with wildlife habitat management, provision for small clearcut openings, together with the seeding of logging areas to perennial grasses for elk and forbs for deer, would be best.

Genetic Study To Improve Browse

Striking variations of individuals within several shrub species indicate that their browse value may be increased materially by selection and breeding. In Utah, adjacent individuals of big sagebrush exhibit extremes of palatability to deer, one being closely cropped and the other ungrazed. Similar differences are found in little rabbitbrush, juniper, and other browse species. Strains of palatable rubber rabbitbrush already have been isolated and are being used in game range restoration. Several other shrubs show great promise for improvement by selection and hybridization. Fertile seed from controlled crosses of fourwing saltbush × shadscale saltbush and fourwing saltbush × Gardner saltbush have been obtained. Also intergeneric crosses of fourwing saltbush with spiny and spineless hopsage have been successful. Interspecific crosses among native mountain-mahoganies and intergeneric crosses in the bitterbrush-cliffrose-Apache plume group have been found. These variations and compatibility for hybridization indicate great possibilities for the development of shrubs with qualities to fit the various habitats and uses for wildlife.

FOREST SOIL AND WATER RESEARCH

Vegetative Growth and Water Yield

Water yield increased as newly established grass cover declined on an experimental watershed at the Coweeta Hydrologic Laboratory in western North Carolina. In the first year after removing the original forest cover, K–31 fescue was seeded. This is a deep-rooted grass that grew tall and dense as a result of heavy fertilization. It used as much water as the oak-hickory forest it replaced, although the water use occurred earlier in the growing season. Without fertilization in succeeding years, grass production decreased and

water yield increased. After 4 years, water yields were over 5 inches greater per year than with the original tree cover. Then fertilizer was again applied. Grass production went up, and water yield decreased to original levels. This indicated the direct relationship between herbage production and water use. For maximum water yields through vegetation change, watershed managers might aim for a grass cover having shallow roots, low vigor, and just enough density to hold the soil and prevent erosion.

Detergents Reduce Erosion

Treatment of water-repellent soils with a wetting agent resulted in a 95-percent reduction in debris movement and a fourfold increase in grass establishment on burned chaparral watersheds in southern California. During the fire, hydrophobic substances from the chaparral litter were deposited on the sandy soils, causing them to be water repellent. Rain falling on these soils does not soak in but runs off rapidly, eroding the soil as it goes. Chemical wetting agents—detergents—tend to counteract the water-repellent nature of these soils, allowing the water to penetrate. Under normal rainfall, the wetting agent will remain effective for about 1 year. Detergent sprays to hold soil in place on steep, newly burned slopes may be useful to prevent excessive damage to densely populated areas below.

Streamflow Increased During Drought

Complete clearing of the forest by cutting and use of herbicides prevented any vegetative growth and increased water yield by almost 7 inches during the dry summer of 1965. This period was by far the driest in the 15 years of record on the Fernow Experimental Forest in West Virginia. The treated area, cleared in 1964, is the upper half of an experimental watershed. The lower half, which will be similarly treated in the near future, includes the stream bottom and is the wetter of the two halves.

The wetter part of the watershed is expected to give the greater response to treatment, but even the response of the drier half was considerable. The increased yield in 1965 amounted to 1,000 gallons per day from each treated acre—enough to satisfy the daily domestic needs of 15 to 20 people during the drought period. At the same time, water quality was maintained at a high level. In contrast to an earlier clearcutting in which the loggers intentionally used careless roadbuilding and skidding methods, the recent cutting followed prescribed careful logging practices. The results were conclusive: Flow has remained clear most of the time and the maximum turbidity was a modest 80 parts per million as against a maximum of 56,000 parts per million after the earlier cutting.

Rehabilitating Rangelands

A little-known ground cover shrub called squaw carpet (*Ceanothus prostratus*) holds considerable promise for rehabilitating damaged watersheds. It is an ideal plant for stabilizing soil on harsh sites; it grows well on infertile soils of steep slopes, is not grazed by cattle or big game, and forms a solid cover less than 1 foot high. Many single plants grow to 10 feet in diameter and even larger. Every branch of this prostrate shrub is abundantly rooted, giving the plant exceptionally good soil-holding capability. It is so little known because its native range is a limited area of the Sierra Nevada. Tests are being made of squaw carpet's ability to become established in other areas. So far, the results have been very good. Outplantings in Idaho and Utah survived better than a control planting in its native range. Furthermore, in Idaho the greatest survival was found on the most severe site —a steep, unstable, infertile road fill of decomposed granite. Extending the range of this useful plant will be most valuable in rehabilitation work.

Breakthrough in Snowpack Measurement

A breakthrough in the technique of measuring snow to predict summer water supplies has been achieved. The new system may eliminate or greatly reduce the need for snow survey crews to make dangerous monthly treks into the mountains. Five nuclear systems to measure snow density were investigated at the Central Sierra Snow Laboratory in California. One of them—a two-probe gamma-transmission system—is superior to the others and much superior to conventional methods of measuring snow. The measurements do not destroy the sampling site as other methods do, so it can be sampled again and again. The system has been further improved by developing a motorized gage that can be operated by radio from an office miles away. Measurements of snow depth and snow density are transmitted back by radio. A portable system, weighing about 30 pounds, has also been developed. This system can be used in glacier research in Alaska and snow research on the Continental Divide. Its ability to sense high rate of snowmelt from rain-on-snow storms will make it invaluable in flood forecasting.

FOREST FIRE RESEARCH

Fire Research Results at Work

Regional seminars and training meetings provide a fast way to get forest fire research findings into practice. In 1966 five 3-day seminars on prescribed fire were conducted by staff specialists at the three forest fire laboratories. Two seminars held in the East and three in the West had a total attendance of more than 230 persons. These represented Federal, State, and private land management and protection agencies. Although the programs were identical with respect to principles involved, each was tailored to meet the specific needs of the regional groups.

The objectives of the seminars were to instruct land management personnel in the wise use of prescribed fire, emphasizing its advantages and

limitations; and to equip them with technical information and aids to be used in training their own personnel. Small groups in the West were also given intensive training in the interpretation of infrared imagery employed in large fire reconnaissance. Infrared scanning from the air locates a fire's perimeter and pinpoints spot fires even in darkness or through dense smoke. Trained interpreters are needed to accurately transfer the information to aerial photos or topographic maps.

Weather and Forest Fires

Weather influences every aspect of the fire control job. Current research is concerned with the interactions of atmospheric variables and fire, and with the structure and behavior of weather itself.

Because of the complex nature of weather effects, study of fire phenomena in natural fuels in the open is difficult and complicated. To reduce the number of variables that must be considered at one time, model fuel beds are studied in the laboratory. By this means such key factors as density and porosity of fuel, wind, temperature, humidity, and slope can be controlled. This greatly reduces the number of trials required and the time needed to analyze the results of each.

Study of model fires in the wind tunnel have shown, for example, that the effects of slope and wind are quite different. It now appears that slopes less than 30 percent have little effect on rate of fire spread, and only where slopes are greater than 40 percent is the effect very pronounced. Wind, on the other hand, increases fire spread at relatively low speeds with increasing impact throughout the normal range of wind speeds encountered on wildland fires. These findings will have an important bearing on planning fire control operations. Our fire-weather scientists have developed a new system for predicting the incidence, severity, and duration of critical fire weather. The results identify factors that must be considered in characterizing major fire-weather types. Guides have been prepared to identify specific fire weather patterns for local use. Utilizing data from a nationwide network of 89 weather stations, these guides can mean increased efficiency in weather and fire danger forecasts with substantial savings in fire control costs.

Lightning starts many fires in the mountainous West. The Project Skyfire cloud seeding experiment now shows more than 30 percent fewer cloud-to-ground lightning discharges from seeded storms. Approximately 5,000 lightning discharges recorded during 3 years of tests were used in the evaluation.

Study of Mass Fires

A field-scale, mass fire-behavior research program, sponsored jointly by the Forest Service and the Department of Defense, conducted its two largest test fires in 1966. A 40-acre fire burned 6,400 tons of fuel in the winter when fuels were wet. A comparison test was made in June with extremely dry fuels. Designed to measure the factors that contribute to the development of firestorms, each test produces several miles of data on punched tape. Translating these records into accurate pictures of the fire and its environment is now in process.

Man-Caused Forest Fires

Fire prevention research in the West and South continues to provide important clues on how to promote fire prevention. Benchmark studies in Butte County, Calif., and Louisiana were both completed this year.

To establish a satisfactory level of occurrence of human-caused forest, brush, and grass fires in Butte County, research has now identified the 10 percent of the 60,000 population who are high risks or live in high fuel hazard areas. Concentrating prevention efforts on this 10 percent, with only maintenance programs for the remainder, will greatly reduce fire numbers. This same principle could be successfully applied to other high hazard wildland areas in the United States.

Results of interviews from a selected ranger district on a Louisiana National Forest noted for high fire occurrence provides detailed information on the beliefs, characteristics, and attitudes of the people. The study showed that over two-thirds of the people favor fire regulations. Cattle owners are still largely unfavorable to fire prevention.

These findings will be useful in orienting prevention activities in most areas in the South. They point to the following measures that should help fire control organizations prevent fires: (1) Heighten public awareness that fire prevention is a public concern; and (2) aim prevention efforts at older, less educated persons with little experience outside of their isolated environment.

FOREST INSECT RESEARCH

Attraction and Sterilization Techniques

Scientists at the University of California and Stanford Research Institute, working together under Forest Service grants, made a major contribution in 1966 by synthesizing the sex attractant for *Ips confusus*, an important western bark beetle. The techniques and principles developed in this research will likely provide a basis for the development of attractants of other bark beetles. In time it may be possible—using laboratory-produced attractants—to lure destructive insects into locations where they can be trapped, sterilized, or otherwise destroyed.

Recent research results should speed progress toward control of the European pine shoot moth, an insect which could become a serious threat to the pine industry in the Pacific Northwest. Knowledge of the insect's behavioral aspects of mating, and of its daily and seasonal emergence patterns, is being accumulated. Such information is essential to the development of a sterile-male technique. In this technique, sterilized male moths would be released to mate with female moths in the native

population. Females mated with sterile males would not produce offspring and within a few generations the field populations would be largely eliminated.

Combinations of these techniques—such as using attractants to lure insects to places where they can contact and pick up a chemical sterilant—have been demonstrated to be successful in other fields of entomology. They may provide similar successes in forest insect control.

Biological Control

The use of insect parasites, predators, and diseases to control populations of pest insects is another highly promising approach that offers alternatives to chemical insecticides. Laboratory research at Corvallis, Oreg.; Durham, N.C.; Delaware, Ohio; and New Haven, Conn., is particularly aimed at using these kinds of organisms against some of our destructive forest insects.

This emphasis is beginning to pay off. A tiny wasp, parasitic on the smaller European elm bark beetle that spreads the Dutch elm disease, has been imported from Europe in an effort to control the beetle. A successful rearing method has been developed and the parasite has proved effective against the beetle in controlled field tests in the Central States. These and other imported insect enemies of the bark beetle disease vector may prove to be a substitute for, or a supplement to, the present method of controlling the Dutch elm disease; i.e., the use of sanitation measures and spraying trees with insecticides.

In certain areas in the eastern United States and the Pacific Northwest, as well as in eastern and western Canada, the balsam woolly aphid is slowly causing the decline and death of several species of true firs. The aphid was accidentally imported from Europe without its normal complement of natural enemies, and has spread virtually unchecked in North America. Cooperative programs with India, Pakistan, and European countries have resulted in the importation of about 50 species of insects that are predaceous on aphids. Six species are now well established and are helping to slow down the further spread of the pest insect; however, they are far from being completely effective. Exploration overseas is continuing with the hope that highly effective predators may be found.

Research on insect diseases has shown that materials in the foliage of some trees inhibit the growth of *Bacillus thuringiensis*, a commercially produced bacterial insecticide, and make it less toxic to pest insects. However, researchers at the Corvallis, Oreg., laboratory have shown that it may be possible to breed strains of the bacillus that are resistant to these substances, and will retain their toxic action against the pest insects.

Chemical Control

While attractants, sterilants, and biological control techniques are effective against some insects and promising against others, their wide application is probably some years away. Chemical control is still the only weapon immediately available to the land manager against many insects. Intensive study to improve chemical control techniques is underway, aimed at producing materials and treatments that are safe to man, fish, and wildlife as well as to parasites, predators, and other harmless or beneficial insects. Progress in 1966 included promising large-scale field tests using Zectran, a nonpersistent insecticide that researchers hope may replace DDT in the control of the spruce budworm, the most serious North American defoliator pest.

In artificial forest regeneration, quality seed produced in seed orchards sells at high prices which makes even small losses due to insects economically unacceptable. In the South, hydraulic sprays are generally used to keep cone and seed insects under control. They are expensive, however, and as the trees grow taller total coverage becomes increasingly difficult. A study in Florida disclosed that insecticides applied with mist blowers are almost as effective as hydraulic sprays. At the same time much less chemical is required and the taller trees—sometimes the best cone producers—can be adequately covered.

FOREST DISEASE RESEARCH

Fungal Protection for Trees

Laboratory experiments have confirmed the root-protecting ability of mycorrhizal fungi. Douglas-fir seedlings, on which mycorrhizae were formed with the fungus *Corticium bicolor*, suffered no root damage whatever when subsequently inoculated with cultures of a root-killing *Pythium* species. Seedlings grown under identical circumstances except for omission of the mycorrhizal forming *Corticium* suffered loss of about one-third of their root system after inoculation with the *Pythium*.

Another indication of the root protection afforded by certain mycorrhizal fungi was noted in studies of nematodes. A new species of nematode (genus Meloidoderra) was observed infesting mycorrihizae of a 20-inch Douglas-fir in western Oregon. Of the six different types of mycorrhizae found on the tree's root system, however, the nematode was absent on four, occasional on the fifth, and abundant only on the sixth. Apparently, the fungi that produced the first four types of mycorrhizae in some way repelled the nematode. Research is now underway to determine the nature of this repelling force, and to devise methods to encourage desirable mycorrhizal formation.

Rust and Dwarfmistletoe

Over the years, there have been occasional reports of lodgepole pines infected with both dwarfmistletoe and comandra rust. The interrelationships of these double infections have been questioned periodically but not investigated. Re-

cent microscopic studies of sections from lodgepole pine infected with both pathogens revealed the rust capable of penetrating the dwarfmistletoe tissues as well as those of the coniferous host. A likely reaction to this discovery is that the rust might be encouraged to grow on dwarfmistletoes, restrict their development and seed production, and ultimately control the disease. However, it appears doubtful that the rust fungus really parasitizes or gains nourishment from the dwarfmistletoe; but rather it penetrates that pest on the strength of food reserves gained from the pine host. Thus, in the case of lodgepole pine, dual parasitism by a dwarfmistletoe and rust probably has no practical importance in biological control or the spread of either of the pathogens, but it is significant to an understanding of the basic principles of disease development that a single mycelium can simultaneously parasitize both its gymnosperm host and angiosperm tissue. In this manner, rusts may attack a greater variety of host plants than they could normally if entirely dependent on spore germination and direct penetration for successful infection.

High Temperatures and Low Infections

High soil and stump surface temperatures appear to be the all-important reason for relatively low root-rot infections when southern coniferous plantations are thinned during the summer months. The root-rotting fungus, *Fomes annosus*, spreads primarily by means of airborne spores which infect freshly cut stump surfaces. The fungus grows through the stump and into the roots where it may spread to nearby trees through root grafts or contacts. Experiments in the southeastern United States prove that successful attack by *F. annosus* during the spring and summer months (March–September) is decidedly less than during the fall and winter months. Records of temperatures of stump surfaces and of the air at stump height indicate that temperatures of 40° C. or above were maintained for 1 to 2 hours on several consecutive days during the summer. Laboratory tests have proved that spores of *F. annosus* cannot germinate and grow under these conditions. The southeastern studies strongly support previous indications that potential losses from the fungus can be substantially reduced by limiting all thinning to the summer months.

Pine Canker Outbreaks

A disease known as Scleroderris canker has been causing serious damage in red and jack pine plantations in upper Michigan and northern Wisconsin for the past several years. In the spring of 1966, cankers presumed to be caused by the same fungus were found in nurseries throughout the northern area. Millions of young seedlings were destroyed and the vast planting program nearly stopped. The importance of red and jack pine to the economy of the area makes effective control of this problem imperative. Research has quickly determined that the current nursery epidemic is the result of several canker-forming fungi rather than *Scleroderris* alone. These fungi appear to be favored by the prolonged spring snows and recurrent summer frosts that characterize the problem areas. The reasons for their sudden prominence and/or increased pathogenicity are still unknown. As an interim measure, researchers have recommended that natural depressions and low, flat pocket areas be avoided when planting either red or jack pine and that foresters favor spring planting over fall planting.

Administrative Support Functions

National Forest administration, forestry research, and cooperative forestry programs all rest on a foundation of effective administrative support. Personnel administration insures the continued recruitment of high-caliber men and women and helps them to develop their careers to full potential. Budget and fiscal offices help the Forest Service to use appropriated funds for the maximum public service. Administrative management continually studies and improves methods of operation. New or special programs get the support of intensive planning. Publications, procurement, communications, legislative liaison—these and many other functions are part of the overall Forest Service support operation.

ADMINISTRATIVE MANAGEMENT

Civil Rights

Forest Service efforts in this area relate to Executive Order 11246 and Title VI of the Civil Rights Act of 1964.

Our participation includes an active operation to employ minority group members. Nationwide needs were determined and recruiting schedules set, including increased recruiting at Negro colleges. As a result, minority group members are now working in business management, engineering, accounting, digital computer programing, teaching, and counseling. Also, minority group graduates of the Job Corps Conservation Centers are urged to continue their schooling and aim toward a career with the Forest Service.

Approximately 2,400 contracts were awarded subject to Executive Order 11246, including construction, maintenance, and purchasing contracts. Prework conferences with contractors stressed the rules under this order as they applied to the prime contractor as well as any subcontractors.

Title VI of the 1964 Civil Rights Act applies to the 25 percent of Forest Service receipts paid to the States annually for schools and roads, requiring that no person be excluded from participation on the ground of race, color, or national origin. There were 7,751 recipients (counties and school districts) of these funds, of which 99.4 percent complied with the law. Recipients are periodically reviewed to assure continued compliance.

Cost Reduction and Operations Improvement

In the Government-wide Cost Reduction and Operations Improvement program, the Forest Service worked toward a goal in fiscal year 1966 of $10.5 million in savings. The goal was achieved and exceeded by $3.8 million. Early in April 1967 the Secretary of Agriculture held a special merit award ceremony to honor this and other outstanding Department of Agriculture cost reduction achievements; five awards went to the Forest Service in recognition of its contributions. A formal semiannual reporting system is now instituted to keep the Forest Service moving in this important program.

Employee Suggestions

The Forest Service continues to emphasize employee participation in the search for ideas that help to improve service, cut costs, or increase effectiveness of operations. Three particularly outstanding suggestions were recognized in an in-Service promotion brochure; the five employees who submitted these suggestions received cash awards amounting to $5,095.

Quarters Rental Reappraisal

The Forest Service realized a savings of over $32,000 through the reappraisal of quarters rental base rates in 1966, using the Consumer Price Index-Rent as an adjusting factor. Quarters rental rates will again be appraised in 1969 using the same technique. At that time, the Bureau of the Budget will make an evaluation that may determine possible use by other Government agencies.

Project Work Inventory

A new inventory has been made of all nonrecurrent work which should be started on each National Forest and each Experimental Forest to meet public needs if the funds required become available. The data have been automated for improved access to information needed for program planning and special area reports. Provision has been made for maintaining a current inventory.

Allotment of Funds for Improvements

New bases have been developed for the equitable allotment of funds for maintenance of improvements in recreation, fire control, and general purpose work. These show for each Region, Forest, and District the percentage of the total job of maintaining improvements in these respective areas of work on lands administered by the Forest Service.

Communications and Electronics

During 1966 the Branch of Communications and Electronics worked with the Office of the Director of Telecommunications Management and

the Interdepartment Radio Advisory Committee to develop a data processing system for inventorying and licensing all radio transmitters operated by the Department of Agriculture. This conforms to national policy that requires all individual Federal radio installations to be recorded, and details of their transmitter operations to be readily available. Increasing demands on the limited frequency spectrum can no longer permit operations far in excess of actual on-the-ground needs.

The computer system is now receiving a full range of data on all Department radio operations. When this process is completed, agencies will be able to get detailed runoffs to help inspection and management without time-consuming field inventories.

Procedures have been developed which the Federal Communications Commission will follow in licensing radio stations to be located on National Forest land. These will permit coordination with other users at a site so as not to disrupt the operation of other installations.

Organization

During the year the Forest Service continued the refinement of its organizational structure for greater efficiency, economy, and effectiveness. In a major action, it established two new State and Private Forestry Area headquarters with responsibility for Forest Service cooperation with 33 State forestry agencies, other organizations, and private landowners (see page 6).

Concurrently, other actions were taken to improve efficiency and to reduce administrative costs. The Regional Office at Upper Darby, Pa., was discontinued, and the administration of the seven northeastern National Forests placed under the Regional Offices in Milwaukee (White Mountain, Green Mountain, Allegheny, and Monongahela National Forests) and Atlanta (Daniel Boone, George Washington, and Jefferson National Forests).

The administrative offices of the Central States Forest Experiment Station were closed, and their functions transferred to the Lake States Forest Experiment Station, St. Paul, Minn., which is renamed the North Central Forest Experiment Station. Projects in Kentucky, formerly administered by the Central States Station, were transferred to the Northeastern Station, Upper Darby, Pa. The Northern Forest Experiment Station at Juneau, Alaska, was reconstituted as the Institute of Northern Forestry, which was attached to the Pacific Northwest Forest and Range Experiment Station. This regrouping is aimed at strengthening the scientific and administrative support for research in Alaska.

Throughout the Service, a major organization planning effort has provided master organization plans for most units. These plans set the direction for organization and staffing patterns and give long-term forecasts of needs for positions and skills.

Automatic Data Processing

Expansion of automatic data processing operations over many years has made it necessary for the Forest Service to update its computer equipment. During 1966 the Service bought and installed four modern computers, three of which replaced obsolete equipment. The fourth upgraded an installation from a low-level tabulating operation to a full-scale computer operation.

The major uses of automatic data processing facilities in the Forest Service are in the areas of civil engineering, resource management, and program support. In civil engineering, two Forest Service employees developed an optimized computer program to analyze road design earthwork; this provided a savings of more than $3.1 million in costs of excavation, overhaul, design, and processing time for road construction.

ADMINISTRATIVE SERVICES

The Forest Service continued to expand its use of contracts in accomplishing program goals wherever they were more economical, efficient, and in the best interests of the Government. It is estimated that in fiscal year 1966 this use of contract work represents an average 10 percent saving compared with costs if Government personnel and facilities had been used. During the fiscal year, the expenditure for supplies and services, including construction, in excess of $2,500 per transaction amounted to $102 million. This is $12 million over the expenditure in fiscal year 1965.

A decision by the Comptroller General affirming Forest Service air tanker contracting procedures paved the way for more effective and economical acquisition of these services. A second decision resolved problems of rate adjustments in contracts extended from year to year.

The Forest Service again achieved considerable savings by the use of excess property during 1966. It acquired equipment, materials, and tools from other Government agencies valued at $23,147,362. Excess valued at $2,293,829 was utilized to further the Job Corps program and $13,662,410 was made available to the States through the Cooperative Forest Fire Control Program. In addition, considerable savings were made by utilizing excess real property for administrative sites, as well as additions to the National Forest System when located within the exterior boundaries of the National Forests.

Training was provided in contract administration to 130 employees at two workshops held early in 1966. A total of 300 trainees have successfully completed this workshop since the start of the program.

In 1966 the first programed instruction course in contracting was delivered to field offices. This covered the subject matter of bid preparation, receipt and opening, evaluation, and contract award. A companion course in the administration of contracts is nearing completion and will be delivered soon. Courses in property management and records

systems are being field tested and should be completed early in 1967. Programed instruction provides a Service-wide standard teaching technique, relieving the work supervisor so that he can give more advanced instruction. It gives the student a reference source for future use. Programed instruction provides these benefits at a moderate cost.

PERSONNEL MANAGEMENT

Recruitment

During 1966 the Forest Service recruited 6,500 new employees to fill permanent full-time positions vacated by retirements, separations and advancements, and to meet the needs of expanding programs. This included approximately 1,000 professional employees in more than 80 separate disciplines and 3,500 to fill positions in responsible support and technician vacancies. Recruiting was carried out through college campus recruitment visits, through four Forest Service Civil Service Boards of Examiners, and local Civil Service Regions.

A new examination announcement was issued for Entomologists and Pathologists. To meet the staffing needs of the Office of Economic Opportunity in Forest Service-administered rural Conservation Centers, examination announcements were issued for teachers, counselors, and resident youth workers. New Civil Service Commission qualification standards were developed and issued for Forestry Aids and Technicians.

Key Position Reorganization

The Forest Service accomplished the major classification changes recommended in the reorganization proposals of the Organization Review Committee (Deckard) study. Top-level changes included the establishment of an Associate Chief of the Forest Service, a Deputy Chief for National Forest Systems, an Associate Deputy Chief for Protection and Development, and Directors of the Northeastern and Southeastern S&PF Areas. Included also were many evaluations and classifications of other key positions involved in this major reorganization.

More than 1,500 Job Corps Conservation Center staff members took part in training programs as the Forest Service assumed additional training responsibilities at its 47 active Conservation Centers. To improve training effectiveness while reducing costs, increased emphasis was placed on the development of guided learning programs to train individuals "on site" as opposed to "off site" formalized group training sessions.

The Forest Service participated in the work-study program for college students under Title I–C of the Economic Opportunity Act, and the Neighborhood Youth Corps program in 11 cooperative agreements. Approximately 600 youths were given employment during the summer of 1966 under the President's Youth Opportunity Campaign.

Through the Government Employees Training Act, 24 career employees successfully completed academic training at graduate schools in various fields of specialization, including mathematics and statistics, heat combustion and transfer, wild-land hydrology, and public administration. An additional 38 employees are enrolled in graduate study programs under the Training Act.

An engineer training system was developed to provide an integrated technical training-and-career approach for the full development of individual employees in this profession. Work has been started on similar systems for foresters, visitor information specialists, landscape architects, and cooperative forestry personnel.

The Forest Service has a pay plan to simplify the employment of casual firefighting personnel. It establishes five levels of firefighters (previously as many as 30 to 50 levels had been used) and three sets of wage rates for three different sections of the Continental United States. This plan should improve employee morale and reduce errors in payments. It was approved by the Secretary's Office, and is also being used by the Department of the Interior.

The Forest Service has started to apply the revised standards for the Forestry Series (460) published in June 1965, Part II of the Supervisory Grade-Evaluation Guide (made applicable to key forestry positions by the revised 460 standards), and other standards issuances covering major occupational areas and key managerial positions. Application of these standards and guides has resulted in classification of a number of positions to grade levels commensurate with their important responsibilities.

Safety and Employee Relations

The Forest Service made good progress towards the President's goal of reducing injuries by 30 percent by 1970. During 1966 injuries were reduced 19 percent.

Forest Service participation was outstanding in a Government-wide drive to increase employee participation in U.S. savings bond payroll deduction plans. Within a few weeks, Forest Service employee participation increased from 32 percent to 87 percent.

BUDGET AND FINANCE

Receipts and Expenditures

Receipts from the sale or use of National Forest resources amounted to $173,901,098 in fiscal year 1966. These receipts came from the following major sources:

Timber	$164, 936, 546
Grazing	3, 324, 985
Other	5, 639, 567
Total	173, 901, 098

This includes $5,966,118 received from National Forest revested Oregon and California Railroad

grant lands. In addition, resource revenue amounting to $1,715,330 was received from National Grasslands and land utilization areas administered under title III of the Farm Tenant Act.

Other amounts received, not listed above, included $1,787,743 contributed by cooperators and timber purchasers for cooperative work on National Forest programs, $22,574,790 set aside for timber sale area improvements, $10,195,672 set aside for brush disposal, $1,577,592 from miscellaneous receipts, and $19,795 for restoration of forest lands and improvements.

The Forest Service sold 145,634 Federal Recreation Area Entrance Permits for a total of $1,019,438 not included in the receipt figures above. These receipts are available for appropriation by the Congress to the Land and Water Conservation Fund.

Direct receipts and deposits from all sources of National Forest programs totaled $211,772,020. In addition, timber purchasers built roads valued at $56,037,267 incident to timber harvest. Other Federal agencies collected approximately $19,364,500 for power licenses, mineral leases, and permits on National Forest land of public domain origin.

Operating expenses for National Forest programs, National Grasslands, and land utilization projects amounted to $215,399,310. Depreciation of roads, trails, and other improvements was estimated at $56,884,288.

Receipts and all other earnings exceeded operating expenditures and other charges by $15,061,235.

Expenditures for other Forest Service activities included $25,580,931 for cooperative State and private forestry programs, and $35,526,348 for forestry research. Cooperator contributions were $2,249,184 for cooperative forestry programs and $921,870 for research. The Forest Service also received $43,046 in royalties from the Smokey Bear forest fire prevention program.

Under the act of May 23, 1908, as amended, the Forest Service pays 25 percent of National Forest net receipts to States for support of schools and roads in counties containing National Forest lands. This payment in fiscal year 1966, based on fiscal year 1965 receipts, was $35,504,367. Arizona and New Mexico school funds also received $112,130 under provisions of the act of June 20, 1910. Under the act of June 22, 1948, Minnesota received $140,619. Counties containing National Grasslands and land utilization areas received $429,041 for schools and roads from calendar year 1965 receipts under the act of July 22, 1937.

By law the Forest Service retains 10 percent of receipts from National Forest resources for development of National Forest roads and trails, except on revested Oregon and California Railroad grant lands. The amount retained in this fund in fiscal year 1966 was $14,203,671.

Accounting Automation and Improvements

In a continuing effort to improve and upgrade accounting operations, systems, and services, the use of four new CDC–3100 computers and the increased capacity of other ADP equipment has resulted in more current and informative accounting reports and information at lower overall costs even with increased volume of business.

An analysis of the professional accounting needs for the next 5 years has been completed and has led to positive recruitment, placement, training, and development of personnel to meet the program and service demands for future periods.

Improvement of accounting and instruction procedures has resulted in the completion and publishing of a Fiscal Review and Analysis Handbook. This establishes guidelines to insure adequate scope of review and analysis at all organization levels, and will serve as an excellent training tool in the field.

PROGRAMS AND LEGISLATION

Legislation

An act to establish the Mt. Rogers National Recreation Area (P.L. 89–438) was prominent in the legislation affecting the Forest Service during the second session of the 89th Congress. The Mt. Rogers National Recreation Area, located in southwestern Virginia, is within a few hours' drive of over 20 million people. The approximately 150,000-acre area is being administered as a part of the Jefferson National Forest. It is the second National Recreation Area established by Congress in which the Federal lands involved are all National Forest lands.

Other laws enacted in the second session of the 89th Congress which affect the Forest Service include: A joint resolution to authorize the President to proclaim a "Day of Recognition" for firefighters (P.L. 89–410), an act to authorize the Secretary of the Interior to transfer certain lands in Colorado to the Department of Agriculture for recreation development of Dillon Reservoir (P.L. 89–446), an act to establish a statute of limitations for certain actions brought by the Government (P.L. 89–505), an act to authorize investigations of certain water resource development proposals (P.L. 89–561), and the Federal-Aid Highway Act of 1966 (P.L. 89–574).

During the second session, the Forest Service followed day-to-day some 650 bills which would affect its activities. It prepared 46 legislative reports on bills and legislative proposals, assisted in the preparation and presentation of 21 statements before congressional committees; and reviewed and commented on 34 reports prepared by other Federal agencies. Legislative drafting services were provided as requested on five proposed bills.

Programs and Special Projects

The Forest Service studied or proposed several new programs and special projects, which were developed in close coordination with other agen-

cies. These projects and analyses are in response to increased public demand for greater use of all the Nation's natural resources.

As a participating agency in the Federal Task Force on the Potomac, the Forest Service contributed substantially to the preliminary report of the Sub-Task Force on Recreation and Landscape, released at midyear. Forest Service representatives also took part in public workshops, hearings, and data refinements for the final task force report to be issued early in 1967.

Other work with the Federal Task Force on the Potomac included formulation of an accelerated forestry program that would bear on sedimentation and erosion control problems. The Forest Service assisted in the revision of the Department's 1963 Report on the Potomac and recommended programs for upstream reservoirs, accelerated erosion and sedimentation control, State and private forestry, and an extension of the George Washington National Forest.

The Forest Service developed a comprehensive 10-year program for the Potomac Region. It is designed to emphasize the Forest Service programs that will contribute the most towards making the Potomac Valley a model of conservation. Special studies included extension of the National Forest System in Virginia and West Virginia, wild river status for the lower Shenandoah and Cacapon Rivers, and the Spruce Knob-Seneca Rocks National Recreation Area.

In another major interdepartmental activity, the Forest Service participated in the nationwide trails system study. A special report was completed for inclusion in the Interdepartmental Task Force report; it included studies of the scenic and popular Pacific Crest, Continental Divide, and Appalachian Trails.

Several new programs and studies received major attention. Following departmental review, proposals for a comprehensive 10-year Program for State and Private Forestry underwent major revision, and are now near completion. This program is designed to provide more intensive management on 395 million acres of non-Federal forest land.

A study is underway to investigate the opportunities for comprehensive development of National Forest lands in the Rocky Mountain area.

Completed during the year was a study plan, "Alternative Harvesting and Management Programs for National Forests of the Douglas-fir Region." This will be an in-depth analysis of the economic, technical, and social feasibility of the alternatives for increasing timber harvest on the National Forests within the Douglas-fir region of Washington, Oregon, and northern California.

The Forest Service reported on a proposed program to organize, equip, and train adequate fire prevention and control forces in rural areas. Such forces are needed to handle both structural and wild-land fires, and at present are either nonexistent or inadequate for the protection of the property and businesses of rural people. Such lack of protection accounts for heavy annual loss of homes, machinery, and lives.

The Forest Service also took part in the work of the Department's Conservation Needs Inventory Committee, and in a special analysis of the Forest Service research program as it relates to the overall Department of Agriculture research program. It gave staff support for responsibilities developing from establishment of the Public Land Law Review Commission.

Planning, Programing, Budgeting

The Planning-Programing-Budgeting System (PPBS), instituted in the Federal Government in 1965, made a major impact on Forest Service planning and budgeting processes during 1966. A program structure describing goods and services provided by the Forest Service was developed and coordinated with the new output-oriented Department program structure. An 8-year program and financial plan with particular emphasis on fiscal year 1968 was prepared, as well as 26 program narratives for development of departmental program memoranda.

An important part of PPBS is the selection, orientation, and training of personnel. The Forest Service sent 51 persons to 2-day orientation sessions and 20 persons to 3-week PPBS seminars conducted by the Civil Service Commission. One man was selected for a 9-month university course, and several in-Service orientation and training seminars were conducted. A special team has been assigned to develop a Management Information System which will support the new PPBS.

Three special studies were undertaken during the year to examine specific problems relating to PPBS: (1) A two-part study of timber largely refines and extends the projections of the "Timber Trends" report, and explores alternatives for increased timber production in the National Forest System. (2) A multiple use planning study will formulate planning guidelines to integrate functional planning on the National Forest System lands more fully, a major objective being the standard measurement of program effectiveness. (3) A study of forest research will investigate the economic significance of augmenting timber supplies, relating program costs (including research) to physical and economic increases.

JOB CORPS ADMINISTRATION

At the end of 1966, more than 7,000 corpsmen were enrolled in the 47 Forest Service-operated Job Corps Conservation Centers. These Centers, located on National Forest land in 29 States, provide education, training, and work experience to prepare corpsmen for employment, and to help them hold their jobs and become self-supporting citizens.

Education and Citizenship

Corpsmen spend approximately 50 percent of their time in the classroom, where they improve their reading ability and learn to solve mathematical problems. With programed texts and a favorable student-teacher ratio, results have been excellent, each man progressing at his own speed. Corpsmen on the average progress one grade level in 3 months.

Citizenship, social skills, and group living are important elements of the Job Corps program. In each Center, these qualities are fostered through a Corpsman Council, supervised by a staff member, which operates under a set of bylaws developed by the corpsmen. The council offers corpsmen an opportunity to practice self-government, to prepare a center welfare budget, and to carry on other activities such as operating a canteen. Through these activities, the Center Director and his staff try to develop leadership qualities in the corpsmen and to channel their energies toward beneficial and meaningful goals. On a communitywide scale, corpsmen have spent many hours in volunteer work, filling sandbags for flood dikes, fighting fires, giving disaster assistance, and effecting many civic improvements.

Work Programs

The Economic Opportunity Act of 1964 requires that corpsmen assigned to Conservation Centers will participate in work directed primarily toward conserving, developing, and managing public natural resources, including the development and protection of public recreational areas. Work performed along these lines by corpsmen has enabled the Forest Service to complete many needed projects, and thus to expand the opportunities for the public to enjoy hiking, camping, hunting, and other recreational activities available to National Forest visitors.

Placement

The real success of the Job Corps is measured largely by the number of young men, 16 to 21 years old, who successfully complete the program. Completion is realized when a corpsman graduates (1) to accept a job in industry or Government, (2) to return to complete his high school education, (3) to become eligible for military service, (4) to attend a trade school, college, or university, or (5) to transfer to an urban Job Corps Center for vocational training. During 1966 more than 7,500 corpsmen successfully completed the program.

DEFENSE PREPAREDNESS

The Forest Service has specific responsibilities as one of the agencies participating in the Nation's civil defense readiness effort. Its duties include the development of an effective national rural fire defense plan, the performance of certain research projects in cooperation with military services and the Office of Civil Defense, radiological monitoring, and other activities to promote civil preparedness in event of a national emergency or major disaster.

Fire Studies and Training

The Forest Service completed on schedule the National Fire Coordination Study, and submitted a comprehensive report, "Defending the United States From Nuclear Fires," to the Office of Civil Defense (OCD). This report outlines a national program of fire defense and the steps required to implement it.

The Forest Service completed rural fire defense training in five pilot States with OCD financing. The program, which started in fiscal year 1964, has trained about 5,600 persons from rural areas and small towns in fire preparedness and suppression. Several States are continuing this training with State funds. Fire leaders in Kentucky, Colorado, and Wyoming received fire defense training through the use of the fire simulator. Nationwide, a very large training job remains to be done, particularly where statewide protection is lacking.

Other rural fire defense activities included development of procedures for estimating damage to resources in forest areas from nuclear attack, revision of regional rural fire-defense plans, and development and testing of methods for estimating ignition and spread of nuclear fires.

Research for Defense

Fire research by the Forest Service continues to help defense agencies on matters related to wartime fire defense and thermal effects of both nuclear and conventional weapons. In cooperation with the Office of Civil Defense, the Advanced Research Projects Agency, and the Defense Atomic Support Agency, the Forest Service investigated techniques of environmental modification, dealing with jungle types of forest growth and other forest types.

The Forest Service completed the study of synoptic weather types sponsored by the Office of Civil Defense and published the results. This study dealt with the frequency of occurrence of critical fire weather in 14 climatic regions, with methods for local climatic analysis, and with the probabilities of successful fire control.

With additional support from the Defense Atomic Support Agency, the Forest Service and OCD expanded research on the measurement of mass fire environments. The main effort was to reorganize the program for British and Canadian input and to prepare for the earliest possible test of a large-scale mass fire, perhaps as large as 1 square mile in extent. One 50-acre test fire was instrumented and burned late in 1965, and a second was burned in June 1966, each involving more than 6,000 tons of fuel. This study is designated as Project Flambeau.

A meteorological research project in the Southeast, sponsored by the Bureau of Naval Weapons, moved ahead with the selection and survey of a site for a moderate size meso-scale network of surface and upper-air stations. Advance analytical studies have been made, and the required instrumentation, recording, and data processing facilities are ready or in the advanced planning stage. Florida State University and the University of Georgia have contracted to help in this work.

Radiation Measurement and Protection

Radiological monitoring is one of the Forest Service's responsibilities within the overall Department of Agriculture defense capability. In the National Forest System, there are now 856 monitoring stations, staffed by 3,300 trained monitors. New monitor training or refresher courses will be given as needed to maintain this function.

The Forest Service continued its efforts to equip its buildings for effective fallout protection. An estimated 5,000 to 6,000 spaces are now available in "hardened" dual-use Forest Service structures. This protection has been achieved at little or no additional costs by planning structural design so that shielding from radioactivity can be obtained without reducing the usefulness or marring the appearance of the buildings.

The Forest Service continued its servicewide program of employee training in personal and family survival, often as an interagency effort in cooperation with USDA State-County Defense Boards. As of June 30, 1966, a total of 3,700 employees had received this training, which will continue toward the goal of giving all employees an understanding of how best to survive during a nuclear emergency.

Statistical Tables

TABLE 1.—*National Forest and other lands administered by the Forest Service, as of June 30, 1966*

State, Commonwealth, or possession	National Forest [1]	National Grassland	Land utilization projects	Total
	Acres	*Acres*	*Acres*	*Acres*
Alabama	631, 543	0	0	631, 543
Alaska	20, 735, 682	0	0	20, 735, 682
Arizona	11, 422, 326	0	0	11, 422, 326
Arkansas	2, 429, 614	0	0	2, 429, 614
California	19, 971, 374	0	19, 115	19, 990, 489
Colorado	13, 724, 688	611, 970	560	14, 337, 218
Connecticut	10	0	0	10
Florida	1, 075, 103	0	0	1, 075, 103
Georgia	780, 630	0	9, 340	789, 970
Idaho	20, 293, 931	47, 599	0	20, 341, 350
Illinois	212, 713	0	0	212, 713
Indiana	127, 105	0	3, 180	130, 285
Iowa	0	0	360	360
Kansas	0	107, 270	0	107, 270
Kentucky	462, 397	0	0	462, 397
Louisiana	591, 530	0	0	591, 530
Maine	49, 551	0	465	50, 016
Massachusetts	1, 651	0	0	1, 651
Michigan	2, 588, 002	0	6, 098	2, 594, 100
Minnesota	2, 782, 189	0	0	2, 782, 189
Mississippi	1, 134, 268	0	0	1, 134, 268
Missouri	1, 365, 905	0	12, 938	1, 378, 843
Montana	16, 669, 699	0	0	16, 669, 699
Nebraska	245, 414	94, 307	0	339, 721
Nevada	5, 059, 461	0	0	5, 059, 461
New Hampshire	678, 477	0	0	678, 477
New Mexico	8, 874, 983	136, 505	87, 704	9, 099, 192
New York	0	0	13, 779	13, 779
North Carolina	1, 124, 470	0	0	1, 124, 470
North Dakota	520	1, 104, 438	0	1, 104, 958
Ohio	114, 555	0	0	114, 555
Oklahoma	238, 473	46, 607	0	285, 080
Oregon	15, 359, 316	102, 980	0	15, 462, 296
Pennsylvania	473, 994	0	0	473, 994
South Carolina	587, 718	0	0	587, 718
South Dakota	1, 121, 220	862, 930	2, 885	1, 987, 035
Tennessee	599, 795	0	1, 212	601, 007
Texas	658, 023	117, 269	0	775, 292
Utah	7, 971, 961	0	0	7, 971, 961
Vermont	232, 991	0	0	232, 991
Virginia	1, 473, 036	0	0	1, 473, 036
Washington	9, 690, 701	0	520	9, 691, 221
West Virginia	909, 441	0	0	909, 441
Wisconsin	1, 470, 524	0	430	1, 470, 954
Wyoming	8, 570, 489	573, 156	0	9, 143, 645
Puerto Rico	27, 889	0	27	27, 916
Virgin Islands	147	0	0	147
Total	182, 533, 366	3, 805, 031	158, 613	186, 497, 010

[1] This column includes all lands administered by the Forest Service, except National Grasslands and land utilization project lands which are shown separately.

TABLE 2.—*Volume and value of timber cut and sold in National Forests, timber stand improvement, and area planted and seeded to trees, fiscal year 1966*

State and Commonwealth	Timber sold			Timber cut		Timber stand improvement,[2] fiscal year 1966	Area planted and seeded to trees	
	Sales	Volume	Value[1]	Volume	Value[1]		Fiscal year 1966	Total planted and seeded to June 30, 1966
	Number	*Thousand board feet*	*Dollars*	*Thousand board feet*	*Dollars*	*Acres*	*Acres*	*Acres*
Alabama	319	54, 377	1, 424, 782	66, 454	1, 518, 960	8, 302	5, 900	91, 680
Alaska	58	539, 734	4, 083, 720	441, 974	924, 414	0	0	4, 759
Arizona	851	164, 002	761, 971	277, 881	1, 629, 126	21, 040	2, 309	10, 885
Arkansas	940	118, 455	3, 756, 940	144, 376	4, 152, 501	31, 875	3, 637	67, 355
California	2, 619	2, 075, 801	29, 694, 754	2, 061, 440	29, 854, 524	25, 342	22, 880	222, 669
Colorado	802	131, 880	560, 983	220, 482	969, 295	6, 219	9, 357	107, 514
Florida	297	85, 471	1, 257, 599	67, 408	948, 495	812	6, 905	74, 898
Georgia	405	57, 380	1, 797, 748	48, 638	1, 231, 478	5, 460	2, 011	54, 485
Idaho	1, 993	993, 089	7, 118, 670	994, 156	7, 107, 780	6, 140	24, 417	203, 920
Illinois	65	4, 892	149, 708	3, 794	61, 967	2, 089	871	51, 775
Indiana	58	5, 073	88, 945	2, 282	24, 077	1, 286	1, 014	28, 841
Kentucky	254	36, 339	424, 291	29, 989	433, 125	7, 437	1, 157	4, 825
Louisiana	252	84, 105	1, 953, 383	62, 498	1, 062, 435	15, 894	3, 071	164, 989
Maine	9	4, 252	52, 190	1, 330	15, 815	695	0	67
Michigan	653	187, 538	1, 158, 729	150, 933	906, 770	10, 953	11, 519	655, 953
Minnesota	575	148, 968	874, 396	120, 314	610, 894	8, 059	9, 859	205, 951
Mississippi	953	146, 828	3, 574, 132	139, 810	2, 769, 399	37, 635	10, 281	247, 322
Missouri	459	55, 618	899, 201	54, 785	703, 814	25, 655	7, 351	110, 479
Montana	1, 857	703, 042	6, 121, 151	798, 701	7, 465, 132	12, 885	13, 326	99, 578
Nebraska	28	40	292	34	265	190	766	33, 218
Nevada	27	536	2, 868	205	940	1, 700	241	861
New Hampshire	73	29, 250	365, 636	21, 087	267, 677	12, 487	8	1, 189
New Mexico	2, 020	149, 779	586, 674	120, 083	540, 340	6, 649	5, 932	15, 150
New York	1	9	90	36	679	59	0	42
North Carolina	433	60, 395	1, 015, 182	54, 350	1, 070, 653	9, 162	2, 695	41, 519
North Dakota	10	14	113	25	240	0	0	967
Ohio	61	5, 915	65, 830	5, 242	56, 416	1, 407	1, 044	22, 484
Oklahoma	62	7, 602	242, 483	6, 164	154, 042	3, 075	232	13, 128
Oregon	2, 815	3, 282, 713	110, 029, 872	3, 825, 102	95, 036, 163	59, 628	45, 783	503, 594
Pennsylvania	74	36, 714	1, 247, 339	27, 059	1, 021, 214	12, 503	106	19, 854
Puerto Rico	3	3	80	2	75	0	0	0
South Carolina	243	115, 426	3, 410, 570	88, 689	2, 213, 670	4, 595	3, 402	35, 256
South Dakota	199	91, 387	318, 198	54, 939	303, 842	7, 783	2, 167	45, 689
Tennessee	171	23, 613	377, 564	33, 309	468, 934	6, 386	1, 585	13, 913
Texas	266	106, 790	3, 337, 188	106, 029	2, 546, 007	6, 204	2, 458	62, 204
Utah	703	75, 679	213, 391	55, 660	273, 782	6, 861	2, 741	14, 074
Vermont	21	18, 988	1, 188, 489	18, 410	520, 879	6, 500	0	1, 430
Virginia	410	56, 979	435, 664	59, 045	374, 151	8, 838	2, 418	11, 779
Washington	1, 778	1, 498, 628	35, 656, 254	1, 734, 549	26, 771, 514	12, 176	23, 133	306, 649
West Virginia	240	49, 436	841, 716	42, 183	664, 330	15, 361	940	20, 329
Wisconsin	372	92, 520	689, 079	90, 828	577, 337	10, 504	3, 158	257, 062
Wyoming	494	83, 707	236, 663	108, 126	337, 091	5, 788	2, 166	16, 145
Total	23, 923	11, 382, 967	226, 014, 528	12, 138, 401	195, 590, 242	425, 634	236, 840	3, 844, 481

[1] Includes amounts authorized by the Knutson-Vandenberg Act of June 9, 1930 (16 U.S.C. 576b) for reforestation and timber stand improvement.

[2] Includes release, weeding, thinning, and pruning only.

TABLE 3.—*Estimated legal harvest of principal big-game animals* [1] *in National Forests and National Grasslands, fiscal year 1966*

State	Deer	Elk	Bear	Moose	Turkey [2]
Alabama	1, 100				660
Alaska	12, 000	200	850	470	
Arizona	15, 000	1, 400	140		2, 000
Arkansas	3, 200				
California	32, 000		1, 100		380
Colorado	63, 000	13, 000	730		430
Florida	2, 000		30		530
Georgia	1, 800		3		120
Idaho	41, 000	12, 000	1, 800	140	
Illinois	3, 600				40
Indiana	350				
Kentucky	130				6
Louisiana	1, 800				
Maine	150		13		
Michigan	24, 000		220		160
Minnesota	15, 000		280	1	
Mississippi	3, 800				570
Missouri	3, 800				240
Montana	39, 000	7, 700	1, 400	580	220
Nebraska	700				190
Nevada	9, 000	10			2
New Hampshire	900		60	1	
New Mexico	17, 000	590	200		1, 100
North Carolina	3, 600		140		25
North Dakota	3, 600				15
Ohio	30				2
Oklahoma	190				25
Oregon	61, 000	10, 000	1, 000		35
Pennsylvania	5, 600		50		1, 360
South Carolina	840		1		160
South Dakota	7, 600	50			570
Tennessee	1, 400		30		60
Texas	1, 400				
Utah	64, 000	1, 000	35	10	60
Vermont	1, 000		90		
Virginia	9, 400		160		2, 100
Washington	22, 000	5, 000	1, 400		10
West Virginia	3, 900		70		660
Wisconsin	8, 800		150		
Wyoming	31, 000	12, 000	340	690	2, 100

[1] Figures rounded in posting.
[2] Turkey classed as a big-game species for this report.

TABLE 4.—*Construction, reconstruction, and maintenance of National Forest (forest development) roads, bridges, and trails, fiscal year 1966*

State and Commonwealth	Roads				Bridges, construction	Trails		Total obligations [1] from all U.S. funds
	Construction and reconstruction	Construction and reconstruction by timber purchasers		Existing		Construction and reconstruction	Existing	
	Miles	*Miles*	*Dollars*	*Miles*	*Number*	*Miles*	*Miles*	*Dollars*
Alabama	3. 1	3. 8	18, 096	768. 8	1	0. 0	0. 0	601, 215
Alaska	13. 0	18. 5	1, 308, 000	240. 9	1	2. 5	511. 1	2, 362, 845
Arizona	94. 4	66. 6	400, 000	10, 530. 8	2	26. 2	3, 587. 7	3, 559, 547
Arkansas	18. 2	12. 2	80, 194	2, 653. 6	4	0	0	1, 464, 555
California	80. 7	1, 008. 1	13, 630, 222	34, 906. 6	14	142. 4	14, 889. 1	28, 253, 940
Colorado	141. 7	64. 9	462, 501	12, 340. 6	6	124. 6	9, 687. 2	5, 332, 571
Florida	41. 1	11. 3	21, 943	1, 133. 9	6	0	0	513, 217
Georgia	11. 9	0	0	1, 279. 4	1	0	182. 6	754, 288
Idaho	130. 4	594. 9	4, 239, 428	17, 124. 3	29	60. 4	19, 134. 9	11, 861, 200
Illinois	0	0	0	408. 1	0	0	57. 9	113, 042
Indiana	2. 4	0	0	1, 100. 4	0	0	0	98, 000
Kansas	0	0	0	88. 6	0	0	0	2, 510
Kentucky	9. 1	7. 0	43, 091	1, 271. 1	0	0	114. 3	508, 268
Louisiana	51. 8	29. 3	137, 246	997. 8	32	0	0	517, 183
Maine	3. 5	0	0	57. 8	0	0	85. 8	37, 433
Michigan	39. 3	0	0	4, 929. 0	0	4. 0	47. 9	1, 402, 622
Minnesota	29. 1	0	0	3, 425. 8	2	0	473. 3	1, 865, 714
Mississippi	8. 2	38. 2	165, 646	1, 040. 4	18	0	5. 0	566, 060
Missouri	15. 3	0	0	1, 887. 5	1	0	59. 0	429, 322
Montana	93. 5	410. 9	2, 102, 318	14, 524. 6	21	61. 2	14, 761. 5	7, 247, 712
Nebraska	2. 3	0	0	352. 6	0	0	1. 0	117, 957
Nevada	8. 0	0	0	3, 197. 4	1	6. 1	1, 896. 6	864, 825
New Hampshire	6. 9	0	0	278. 4	0	0	1, 056. 8	396, 947
New Mexico	41. 3	3. 0	26, 000	8, 690. 9	4	25. 8	3, 770. 2	2, 470, 688
New York	0	0	0	51. 5	0	0	12. 0	3, 316
North Carolina	11. 7	0	0	1, 126. 9	0	0	1, 209. 8	824, 346
North Dakota	9. 3	0	0	1, 400. 3	0	0	0	111, 421
Ohio	1. 8	0	19, 600	307. 3	0	0	0	84, 374
Oklahoma	2. 3	0	0	217. 2	0	0	0	81, 699
Oregon	226. 9	1, 396. 0	23, 366, 177	27, 768. 9	21	77. 0	8, 264. 4	23, 280, 442
Pennsylvania	23. 7	31. 6	178, 885	890. 1	0	0	84. 1	1, 844, 707
Puerto Rico	3. 6	0	0	0. 6	0	0	38. 9	91, 702
South Carolina	5. 5	12. 0	129, 362	938. 6	3	0	2. 8	517, 850
South Dakota	15. 1	7. 1	40, 014	2, 348. 3	0	0	21. 3	586, 626
Tennessee	11. 8	0	0	801. 0	0	9. 0	566. 0	731, 926
Texas	12. 4	9. 2	21, 282	842. 1	13	0	0	430, 820
Utah	68. 4	33. 5	101, 756	6, 704. 6	8	28. 0	6, 519. 8	3, 302, 750
Vermont	3. 3	1. 1	0	474. 0	0	0	193. 5	244, 148
Virginia	47. 9	8. 2	20, 414	1, 321. 5	1	0	1, 176. 9	779, 397
Washington	76. 8	435. 5	9, 117, 426	11, 127. 2	15	50. 2	7, 867. 8	9, 416, 163
West Virginia	19. 6	12. 5	78, 459	1, 587. 2	0	0	780. 1	788, 854
Wisconsin	46. 6	0	0	3, 004. 0	3	5. 0	5. 0	998, 450
Wyoming	63. 9	79. 0	329, 207	5, 834. 3	5	45. 2	5, 679. 7	2, 857, 410
Dist. of Columbia [2]	0	0	0	0	0	0	0	1, 114, 938
Total	1, 495. 8	4, 294. 4	56, 037, 267	189, 974. 9	212	667. 6	102, 744. 0	119, 433, 000

[1] Total obligations are for construction, reconstruction, maintenance, and flood repair.
[2] Administrative expenses.

TABLE 5.—*Recreation sites and capacities in the National Forests and National Grasslands as of June 30, 1966* [1]

Type of facility	Number of sites, classed according to persons at one time capacity						Area	Normal capacity (persons at one time)
	Under 25	26 to 75	76 to 300	301 to 1,000	Over 1,000	Total		
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Acres*	*Number*
Campgrounds	2,816	1,675	1,290	126	8	5,915	35,027	373,080
Picnic grounds	611	658	337	32	1	1,639	7,317	105,608
Subtotal	3,427	2,333	1,627	158	9	7,554	42,344	478,688
Organization camps owned by Forest Service	5	24	44	2	0	75	1,196	8,445
Organization camps in private ownership	61	117	310	22	2	512	6,260	66,666
Hotels, lodges, resorts owned by Forest Service	3	5	7	1	1	17	282	3,308
Hotels, lodges, resorts in private ownership	69	190	123	16	2	400	3,218	52,418
Other public service sites	59	65	33	9	1	167	621	14,653
Recreation residence sites	1,310	326	311	55	5	2,007	15,988	141,079
Swimming sites	9	78	134	27	1	249	504	42,073
Boating sites	229	209	152	25	0	615	1,105	50,070
Winter sports sites	8	10	49	50	80	197	22,238	303,375
Observation sites	180	119	65	7	0	371	1,433	21,501
Playground, park, sports sites [2]	3	4	10	3	0	20	339	3,735
Visitor centers	5	8	14	4	1	32	406	11,100
Total	5,368	3,488	2,879	379	102	12,216	95,934	1,197,111

[1] In a few instances these figures are less than those shown for fiscal year 1965. Usually this is the result of a more accurate inventory and does not necessarily represent a reduced capacity.

[2] New categories of developed sites recognized as of June 30, 1966.

TABLE 6.—*Use of recreation resources on the National Forests, National*

[Number of visitor-days of recreation use,[1] in thousands]

State	Observation sites	Playgrounds, sports sites	Boating sites	Swimming sites	Campgrounds	Picnic grounds	Hotel, lodge, resorts
Alabama			4.6	16.0	60.0	97.9	
Alaska	5.0		1.7	.2	143.8	56.4	14.7
Arizona	17.9	10.1	51.3	11	1, 269.8	437.2	319.3
Arkansas	3.5		5.5	54.3	215.8	132.1	60.1
California	116.8	5.2	152.3	184.7	12, 023.6	687.3	1, 696.8
Colorado	104.1	.6	22.9		1, 043.4	236.7	98.2
Florida			24	88.3	594.4	81.3	
Georgia	4.9		5	31.7	276.7	40.5	10.8
Idaho	22.9		41.8	20.3	1, 236.7	109.3	142
Illinois	35.2		3.7	23.8	111.7	74.4	
Indiana	.3		3.6	2	13.8	18.3	
Kansas						1.7	
Kentucky	9.9		10.9		67.4	27.5	
Louisiana	.4		3.1	49.2	103	57.9	29
Maine	1.9				8.2	1.9	
Michigan	3	2	27.8	60.3	427.1	85	.9
Minnesota	.3		57.7	30.1	515.4	44.9	108.6
Mississippi			3.9	14.5	42.3	69.1	
Missouri	2.9		15.1	3.9	156.2	135.9	
Montana	168		49.4	223.5	2, 181.7	196.1	154.5
Nebraska	.5			2.2	8.8	9.9	
Nevada	.6	3.9		4.7	298	92.2	
New Hampshire	23.4		3.6	3.3	529.1	35.7	77.3
New Mexico	34.7	6.3	1		875.3	225.7	9.4
New York					4.9	.5	
North Carolina	24.9		10.6	21.7	376.9	220	13.7
North Dakota					1.6	2.8	
Ohio			4	24	63.3	82	
Oklahoma	.3		1.9	13.3	15	28.3	
Oregon	61.6		555.7	68	3, 930.6	376.9	648.4
Pennsylvania	13		1.1	19.6	88.8	29.3	
South Carolina			3.8	3.7	26	39.2	
South Dakota	5.4		9.8	5.7	181	53.6	5.8
Tennessee	2.4		2.2	23.5	315.9	70.5	54.9
Texas	.1		13.5	18	290.5	80.4	3.6
Utah	38.9	.4	33.4	2.4	1, 595.6	274.6	206.3
Vermont	2.6			3.5	37.5	12	
Virginia	9.4		4.7	41	244.2	125.1	.6
Washington	71.3		73.7	13.4	2, 242.8	121.5	106.2
West Virginia	15.5		1.2	17.7	272.6	49.5	
Wisconsin			47.9	41.6	285.9	41.4	3.9
Wyoming	51.7		3.5	15.4	488.8	69.9	284.6
Puerto Rico	5.2			12.5		70.9	8.3
Servicewide	858.5	28.5	1, 255.9	1, 169	32, 664.1	4, 703.3	4, 057.9

[1] Recreation use of N.F. land and water which aggregates 12 person-hours. May entail person for 12 hours, 12 persons

Grasslands, and other lands administered by the Forest Service, calendar year 1966

[Number of visitor-days of recreation use,[1] in thousands]

Organization sites	Commercial service sites	Recreation resources sites	Winter sports sites	Visitor centers	Dispersed use	Total visitor-days	State
					430. 9	609. 4	Alabama.
9. 5		44. 7	55. 5	16. 4	546	893. 9	Alaska.
215	14. 0	246. 3	29. 7	7. 9	3, 475. 8	6, 105. 3	Arizona.
48. 1		41. 7		6. 5	695. 8	1, 263. 4	Arkansas.
2, 959. 7	284. 2	4, 934	1, 215. 5	81. 1	20, 642. 1	44, 983. 3	California.
125. 3	42. 8	162. 4	634. 8	. 4	6, 369. 8	8, 841. 4	Colorado.
107. 3		283. 2		. 7	1, 612. 8	2, 792	Florida.
32. 9		25. 5		4. 4	847. 7	1, 280. 1	Georgia.
161. 4	8. 4	238	216. 3	1. 3	5, 605. 1	7, 803. 5	Idaho.
					345	593. 8	Illinois.
					171. 1	209. 1	Indiana.
					4. 3	6	Kansas.
7. 3		1			488. 5	612. 5	Kentucky.
41. 7		32. 8			310. 4	627. 5	Louisiana.
. 8					18. 5	31. 3	Maine.
88. 1	5. 2	62. 7	65. 8		1, 848. 4	2, 676. 3	Michigan.
70. 1	4. 1	138. 6	12. 2	15	1, 909. 1	2, 906. 1	Minnesota.
75		. 1			427	631. 9	Mississippi.
5. 5					1, 792. 6	2, 112. 1	Missouri.
64	1. 3	383. 8	148. 4		3, 831. 8	7, 402. 5	Montana.
16.1					51.8	89.3	Nebraska.
87.1		26.8	56.4		804.4	1, 374.1	Nevada.
18			68.2	2.5	2, 116.6	2, 877.7	New Hampshire.
63.3	.1	85.8	134.9	13.6	2, 381.2	3, 831.3	New Mexico.
15.8					16.6	37.8	New York.
7.9	6.5	9.4		2	1, 377.3	2, 070.9	North Carolina.
					46.6	51	North Dakota.
					308.1	481.4	Ohio.
					207.2	266	Oklahoma.
310.7	114.9	523.7	643.7	9.5	9, 887.8	17, 131.5	Oregon.
67.2		29.7			961	1, 209.7	Pennsylvania.
					425.5	498.2	South Carolina.
60.3	.8	56.5	10.5	.9	853.1	1, 243.4	South Dakota.
82.6		75.6			805.8	1, 433.4	Tennessee.
4.8					526.1	937	Texas.
194.8	23.6	155.1	284.5	4.3	3, 403.2	6, 217.1	Utah.
			412.5		256.1	724.2	Vermont.
99.7		2.7			2, 115.1	2, 642.5	Virginia.
263.1	12	208.1	773	.3	4, 645.5	8, 530.9	Washington.
51.4		1.1			660.1	1, 069.1	West Virginia.
18.8		9.9	7.9		1, 319.7	1, 777	Wisconsin.
188.5	7.1	185.8	72.8	.2	2, 251.1	3, 619.4	Wyoming.
74.8		1.6			61.3	234.6	Puerto Rico.
5, 636.6	525	7, 966.6	4, 842.6	167	86, 853.9	150, 728.9	Servicewide.

for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

TABLE 7.—*Fires controlled by Forest Service protection organizations, and area burned, 1966*

State	Number of fires, by cause						Area burned (acres)	
	Lightning	Smoking	Recreation	Incendiary	Other	Total	National Forest	Other ownership
Alabama	12	39	20	41	28	140	777	643
Alaska	1	1	11		8	21	40	
Arizona	914	71	93	8	67	1, 153	28, 278	214
Arkansas	46	47	62	101	44	300	2, 968	1, 020
California	872	346	163	62	564	2, 007	151, 251	10, 796
Colorado	212	45	103	3	42	405	1, 187	985
Florida	22	16	9	18	41	106	359	101
Georgia	2	6	13	11	15	47	328	1, 374
Idaho	1, 004	78	98	4	72	1, 256	46, 573	1, 069
Illinois	1	10	5	8	7	31	122	161
Indiana		7	2	10	14	33	66	124
Kansas	1					1		
Kentucky		11	20	25	20	76	621	240
Louisiana		10	8	38	29	85	390	128
Maine								
Michigan	13	44	55	8	148	268	314	536
Minnesota	12	10	31	1	40	94	95	22
Mississippi	4	42	24	69	62	201	1, 029	586
Missouri	12	44	80	137	86	359	1, 476	1, 635
Montana	720	44	66	4	95	929	31, 448	1, 476
Nebraska	11	1			19	31	204	131
Nevada	53	7	3		11	74	12, 216	1, 327
New Hampshire		1	1			2	1	
New Mexico	550	31	34	5	22	642	1, 687	469
New York		1	2			3		
North Carolina	5	14	10	24	41	94	1, 146	537
North Dakota	17	2			4	23	684	41
Ohio		11		9	19	39	73	52
Oklahoma	1	7	7	36	11	62	194	265
Oregon	555	110	179	16	167	1, 027	9, 443	1, 868
Pennsylvania	2	5	7		3	17	163	
South Carolina		29	13	38	57	137	635	1, 517
South Dakota	141	1	5		37	184	4, 234	71
Tennessee	4	7	2	35	45	93	582	351
Texas	2	3	7	2	10	24	630	429
Utah	270	19	60	1	22	372	992	463
Vermont	1				1	2		
Virginia	12	11	18	16	22	79	139	105
Washington	227	66	141	7	101	542	1, 938	666
West Virginia	5	10	5		8	28	143	13
Wisconsin		8	11	3	19	41	35	34
Wyoming	154	21	27		13	215	568	443
Total	5, 858	1, 254	1, 395	740	2, 014	11, 243	300, 061	29, 892

TABLE 8.—*Forest fires on protected State and private lands, and area burned, calendar year 1966; and expenditures for fire control, fiscal year 1966*

State	Area protected	Fires	Area burned	Prevention and suppression expenditures			
				Federal	State and county	Private [1]	Total
	Thousand acres	*Number*	*Acres*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	20, 971	7, 068	190, 708	383, 890	1, 046, 097	131, 886	1, 561, 873
Alaska	14, 500	186	16, 123	47, 000	189, 508	0	236, 508
Arizona [2]	1, 341	14	72	0	0	0	0
Arkansas	16, 535	4, 846	196, 622	394, 080	1, 291, 472	89, 679	1, 775, 231
California	19, 985	2, 763	52, 734	1, 073, 080	25, 458, 114	0	26, 531, 194
Colorado	8, 790	673	7, 361	50, 000	228, 286	0	278, 286
Connecticut	1, 990	615	1, 966	88, 120	385, 796	0	473, 916
Delaware	392	65	126	14, 000	14, 326	0	28, 326
Florida	16, 319	5, 406	77, 347	560, 968	4, 850, 341	0	5, 411, 309
Georgia	23, 941	8, 190	64, 318	558, 940	4, 023, 713	61, 089	4, 643, 742
Hawaii	1, 929	37	2, 221	35, 000	43, 090	0	78, 090
Idaho	10, 501	747	117, 415	213, 630	420, 247	111, 844	745, 721
Illinois	3, 568	347	9, 694	73, 390	239, 427	0	312, 817
Indiana	4, 012	390	6, 295	55, 782	195, 072	0	250, 854
Iowa	2, 609	278	5, 503	47, 000	85, 948	0	132, 948
Kansas	10, 300	2, 386	163, 227	47, 000	324, 000	0	371, 000
Kentucky	10, 774	2, 357	41, 039	246, 090	811, 406	0	1, 057, 496
Louisiana	12, 239	6, 027	70, 086	460, 400	2, 073, 097	19, 380	2, 552, 877
Maine	17, 321	581	1, 360	323, 240	1, 664, 224	0	1, 987, 464
Maryland	2, 855	686	4, 854	145, 130	637, 730	0	782, 860
Massachusetts	3, 252	8, 397	9, 490	148, 310	865, 978	0	1, 014, 288
Michigan	17, 205	1, 672	13, 691	490, 460	2, 098, 828	0	2, 589, 288
Minnesota	17, 653	607	20, 260	300, 210	672, 009	0	972, 219
Mississippi	15, 567	7, 707	96, 975	466, 330	1, 952, 589	0	2, 418, 919
Missouri	10, 285	3, 698	66, 577	318, 860	1, 121, 665	0	1, 440, 525
Montana	4, 806	404	4, 332	154, 140	164, 323	190, 091	508, 554
Nebraska	5, 000	238	45, 637	47, 000	156, 512	0	203, 512
Nevada	2, 216	149	3, 963	81, 130	364, 526	0	445, 656
New Hampshire	4, 339	623	394	89, 740	287, 586	6, 763	384, 089
New Jersey	2, 108	1, 684	13, 587	143, 980	614, 810	0	758, 790
New Mexico	3, 996	88	1, 024	49, 500	170, 552	22, 475	242, 527
New York	12, 621	1, 131	5, 856	298, 263	1, 556, 414	0	1, 854, 677
North Carolina	17, 819	4, 626	126, 005	452, 650	2, 105, 764	36, 571	2, 594, 985
North Dakota	228	1	3	15, 549	15, 549	0	31, 098
Ohio	4, 005	838	2, 515	121, 870	362, 328	0	484, 198
Oklahoma	4, 401	1, 090	108, 732	162, 900	228, 043	23, 599	414, 542
Oregon	13, 099	1, 244	28, 251	526, 650	2, 514, 451	392, 639	3, 433, 740
Pennsylvania	16, 560	1, 353	13, 276	305, 010	1, 312, 249	0	1, 617, 259
Rhode Island	434	224	1, 064	47, 000	130, 356	0	177, 356
South Carolina	12, 050	4, 870	136, 382	420, 680	1, 633, 615	0	2, 054, 295
South Dakota	1, 291	88	1, 128	49, 195	49, 196	0	98, 391
Tennessee	12, 115	3, 896	47, 732	373, 250	1, 728, 466	500	2, 102, 216
Texas	16, 959	1, 684	35, 534	334, 170	830, 201	146, 048	1, 310, 419
Utah	9, 006	328	21, 173	52, 740	137, 036	0	189, 776
Vermont	3, 946	136	249	46, 903	97, 929	4, 896	149, 728
Virginia	13, 973	2, 095	8, 683	368, 920	1, 452, 066	5, 615	1, 826, 601
Washington	12, 509	1, 455	2, 334	539, 840	2, 815, 549	0	3, 355, 389
West Virginia	10, 562	1, 640	54, 093	164, 331	450, 631	0	614, 962
Wisconsin	15, 264	2, 386	8, 317	412, 520	1, 887, 199	0	2, 299, 719
Wyoming	5, 187	143	1, 908	47, 000	53, 405	0	100, 405
Total	469, 328	98, 157	1, 908, 236	11, 845, 841	71, 811, 719	1, 243, 075	84, 900, 635

[1] Private expenditures made under direct supervision of State Foresters as part of the Clarke-McNary program.
[2] Arizona entered the Clarke-McNary program as of July 1, 1966.

TABLE 9.—*Distribution of forest and windbarrier planting stock by cooperating States, fiscal year 1966 (under Clarke-McNary Program)*

State and Commonwealth	Expenditures derived from—				Trees distributed
	Federal allotment	State appropriation	Receipts	All sources	
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Number*
Alabama	3, 000	19, 251	169, 644	191, 895	36, 492, 000
Arkansas	4, 000	27, 045	68, 071	99, 116	13, 297, 000
California	3, 000	29, 411	1, 796	34, 207	2, 546, 000
Colorado	1, 137	1, 337	37, 745	40, 219	414, 000
Connecticut	4, 000	19, 878	33, 971	57, 849	1, 397, 000
Delaware	3, 000	18, 068	----------	21, 068	1, 463, 000
Florida	3, 000	17, 225	287, 125	307, 350	57, 034, 000
Georgia	3, 000	70, 564	171, 073	244, 637	39, 429, 000
Hawaii	3, 000	124, 721	----------	127, 721	1, 305, 000
Idaho	12, 000	13, 836	12, 979	38, 815	543, 000
Illinois	4, 000	59, 310	----------	63, 310	4, 686, 000
Indiana	3, 000	203, 220	85, 229	291, 449	5, 448, 000
Iowa	----------	7, 647	49, 896	57, 543	1, 162, 000
Kansas	12, 000	12, 000	----------	24, 000	1, 069, 000
Kentucky	3, 000	151, 137	39, 091	193, 228	9, 717, 000
Louisiana	3, 000	10, 245	119, 791	133, 036	25, 324, 000
Maine	4, 000	49, 887	57, 382	111, 269	2, 233, 000
Maryland	3, 000	44, 466	4, 462	51, 928	6, 154, 000
Massachusetts	3, 000	56, 598	----------	59, 598	459, 000
Michigan	3, 000	61, 735	88, 897	153, 632	4, 059, 000
Minnesota	3, 000	432, 706	89, 543	525, 249	25, 129, 000
Mississippi	3, 000	160, 195	191, 009	334, 204	46, 153, 000
Missouri	3, 000	112, 625	53, 472	169, 097	6, 284, 000
Montana	12, 000	54, 398	33, 813	100, 211	1, 146, 000
Nebraska	2, 754	2, 754	108, 281	113, 789	2, 502, 000
Nevada	4, 985	4, 985	778	10, 748	90, 000
New Hampshire	3, 000	24, 473	19, 524	46, 997	912, 000
New Jersey	6, 000	9, 200	10, 420	25, 620	897, 000
New Mexico	11, 000	12, 515	5, 292	28, 807	145, 000
New York	3, 000	216, 325	145, 150	364, 475	17, 450, 000
North Carolina	3, 000	84, 244	201, 588	288, 832	34, 727, 000
North Dakota	12, 000	35, 347	39, 044	86, 391	926, 000
Ohio	3, 000	138, 968	122, 837	264, 805	13, 386, 000
Oklahoma	12, 000	29, 666	5, 846	47, 512	806, 000
Oregon	----------	47, 727	47, 728	95, 455	13, 411, 000
Pennsylvania	5, 500	246, 317	82, 217	334, 034	13, 966, 000
Puerto Rico	2, 000	41, 884	----------	43, 884	1, 090, 000
Rhode Island	1, 630	1, 630	----------	3, 260	235, 000
South Carolina	3, 000	52, 588	160, 150	215, 738	33, 569, 000
South Dakota	12, 000	47, 525	44, 712	104, 237	1, 109, 000
Tennessee	3, 000	74, 471	76, 036	153, 507	17, 218, 000
Texas	3, 000	24, 214	28, 123	55, 337	4, 581, 000
Utah	5, 624	5, 748	6, 872	18, 244	149, 000
Vermont	4, 000	33, 323	30, 624	67, 947	1, 519, 000
Virginia	3, 000	17, 234	186, 283	206, 517	33, 360, 000
Washington	----------	60, 502	178, 446	238, 948	5, 985, 000
West Virginia	6, 500	113, 344	----------	119, 844	9, 966, 000
Wisconsin	3, 000	140, 464	159, 918	303, 382	20, 327, 000
Wyoming	3, 081	3, 081	8, 098	14, 260	171, 000
Total	214, 211	3, 226, 034	3, 262, 956	6, 703, 201	521, 440, 000

TABLE 10.—*Planting stock available for forest and windbarrier planting; area planted or seeded on Federal, State, and private lands; and acreage in need of planting*

State and Commonwealth	Planting stock shipped, fiscal year 1966				Area planted or seeded, fiscal year 1966	Planting needs, 1958 [1]
	Federal nurseries	State nurseries	Other	Total		
	Thousands	*Thousands*	*Thousands*	*Thousands*	*Acres*	*Acres*
Alabama	0	37, 842	12, 725	50, 567	76, 728	5, 006, 000
Alaska	0	0	0	0	4	0
Arizona	0	0	0	0	2, 525	40, 000
Arkansas	0	14, 614	0	14, 614	22, 099	1, 405, 000
California	14, 137	2, 920	856	17, 913	39, 322	3, 001, 000
Colorado	7, 822	793	0	8, 615	12, 558	318, 000
Connecticut	0	1, 858	97	1, 955	1, 475	111, 000
Delaware	0	1, 494	0	1, 494	1, 366	11, 000
Florida	0	67, 773	24, 914	92, 687	146, 988	7, 033, 000
Georgia	0	39, 664	30, 044	69, 708	114, 460	6, 344, 000
Hawaii	0	1, 305	40	1, 345	3, 328	810, 000
Idaho	14, 827	520	0	15, 347	26, 402	691, 000
Illinois	0	6, 265	0	6, 265	5, 647	904, 000
Indiana	0	5, 924	300	6, 224	6, 555	330, 000
Iowa	0	1, 683	285	1, 968	1, 802	264, 000
Kansas	0	0	1, 142	1, 142	2, 398	230, 000
Kentucky	0	13, 064	2, 000	15, 064	19, 716	2, 004, 000
Louisiana	0	25, 619	2, 543	28, 162	41, 993	2, 379, 000
Maine	0	2, 652	1, 000	3, 652	2, 750	1, 171, 000
Maryland	0	6, 304	0	6, 304	7, 863	455, 000
Massachusetts	0	459	495	954	912	254, 000
Michigan	10, 044	4, 059	13, 904	28, 007	26, 684	1, 424, 000
Minnesota	5, 607	25, 130	0	30, 737	42, 327	5, 427, 000
Mississippi	21, 648	46, 720	0	68, 368	74, 008	2, 255, 000
Missouri	0	11, 291	0	11, 291	16, 091	3, 200, 000
Montana	2, 744	1, 135	346	4, 225	17, 852	931, 000
Nebraska	4, 073	0	3, 508	7, 581	7, 318	87, 000
Nevada	0	65	0	65	375	30, 000
New Hampshire	0	2, 009	0	2, 009	891	464, 000
New Jersey	0	749	350	1, 099	1, 392	819, 000
New Mexico	0	0	0	0	6, 473	245, 000
New York	0	18, 099	2, 124	20, 223	17, 747	1, 378, 000
North Carolina	0	36, 508	12, 970	49, 478	51, 878	2, 841, 000
North Dakota	0	1, 033	5, 000	6, 033	8, 474	231, 000
Ohio	0	13, 955	0	13, 955	19, 086	616, 000
Oklahoma	0	1, 031	0	1, 031	1, 757	1, 054, 000
Oregon	5, 277	24, 257	8, 184	37, 718	145, 335	2, 008, 000
Pennsylvania	0	14, 851	25, 083	39, 934	49, 860	869, 000
Puerto Rico	0	1, 090	0	1, 090	1, 134	105, 000
Rhode Island	0	0	0	0	407	85, 000
South Carolina	0	42, 310	7, 164	49, 474	65, 144	2, 269. 000
South Dakota	0	440	3, 291	3, 731	11, 422	129, 000
Tennessee	6, 554	18, 459	2, 851	27, 864	21, 701	1, 181, 000
Texas	0	3, 715	5, 772	9, 487	16, 778	2, 235, 000
Utah	0	153	0	153	2, 957	46, 000
Vermont	0	1, 526	0	1, 526	1, 622	274, 000
Virginia	0	32, 833	12, 081	44, 914	64, 782	880, 000
Washington	12, 672	11, 777	1, 806	26, 255	64, 657	1, 136, 000
West Virginia	0	10, 373	75	10, 448	12, 782	567, 000
Wisconsin	0	20, 322	3, 707	24, 029	29, 111	5, 172, 000
Wyoming	0	0	0	0	2, 883	103, 000
Total	105, 405	574, 643	184, 657	864, 705	1, 319, 819	70, 822, 000

[1] As reported in the National Inventory of Soil and Water Conservation Needs, 1962.

TABLE 11.—*Cooperative forest management accomplishments and expenditures, fiscal year 1966*

[U.S. Forest Service and State Foresters Cooperating]

State	Accomplishments				Expenditures		
	Woodland owners assisted	Woodland involved	Products harvested	Gross sale value	Federal	State	Total
	Number	*Acres*	*M bd. ft.*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	583	99, 118	3, 853	342, 728	45, 168	45, 168	90, 336
Alaska	35	1, 750	0	0	15, 535	15, 535	31, 070
Arkansas	949	85, 605	2, 730	72, 794	56, 096	56, 096	112, 192
California	2, 033	263, 814	242, 724	4, 156, 578	53, 100	89, 953	143, 053
Colorado	322	193, 240	110	9, 463	45, 100	52, 151	97, 251
Connecticut	1, 938	46, 267	704	227, 493	32, 700	44, 771	77, 471
Delaware	128	2, 673	1, 577	92, 550	5, 100	5, 364	10, 464
Florida	3, 965	1, 542, 132	12, 682	879, 513	139, 400	258, 446	397, 846
Georgia	4, 018	467, 407	18, 490	994, 254	134, 100	168, 584	302, 684
Hawaii	129	10, 628	140	1, 500	12, 000	12, 172	24, 172
Idaho	904	41, 569	1, 658	126, 196	22, 585	28, 780	51, 365
Illinois	2, 049	43, 898	7, 209	387, 213	72, 700	82, 894	155, 594
Indiana	1, 875	69, 643	6, 666	350, 557	57, 000	58, 617	115, 617
Iowa	1, 915	20, 605	1, 019	756, 143	42, 200	45, 672	87, 872
Kansas	853	11, 752	187	43, 181	46, 500	46, 500	93, 000
Kentucky	3, 310	114, 065	10, 441	402, 165	124, 500	178, 037	302, 537
Louisiana	405	63, 028	1, 850	77, 061	46, 900	47, 169	94, 069
Maine	1, 500	83, 284	8, 937	435, 031	80, 100	104, 238	184, 338
Maryland	1, 619	28, 058	3, 350	125, 044	61, 500	96, 276	157, 776
Massachusetts	2, 667	56, 353	27, 207	427, 389	36, 833	36, 833	73, 666
Michigan	2, 074	67, 173	8, 149	270, 697	98, 300	114, 454	212, 754
Minnesota	2, 848	34, 926	3, 334	265, 402	66, 200	156, 079	222, 279
Mississippi	2, 936	226, 741	5, 265	187, 908	79, 200	103, 282	182, 482
Missouri	3, 092	188, 492	22, 014	565, 454	111, 400	175, 845	287, 245
Montana	327	12, 544	230	8, 460	20, 726	20, 726	41, 452
Nebraska	871	7, 224	588	119, 705	22, 980	22, 980	45, 960
Nevada	182	2, 571	0	0	18, 965	18, 965	37, 930
New Hampshire	2, 991	109, 353	7, 304	367, 687	43, 100	52, 583	95, 683
New Jersey	890	58, 508	1, 803	69, 159	37, 400	62, 379	99, 779
New Mexico	435	678, 623	8, 710	125, 368	28, 200	29, 839	58, 039
New York	8, 087	353, 572	16, 769	1, 504, 376	165, 900	215, 058	380, 958
North Carolina	10, 674	186, 079	51, 681	1, 573, 971	167, 900	310, 005	477, 905
North Dakota	195	17, 891	3, 077	18, 972	26, 214	26, 214	52, 428
Ohio	3, 074	66, 516	8, 561	649, 445	92, 900	113, 213	206, 113
Oklahoma	223	10, 254	0	3, 100	12, 437	12, 437	24, 874
Oregon	1, 580	57, 571	2, 123	196, 267	32, 700	41, 531	74, 231
Pennsylvania	3, 396	86, 811	2, 060	247, 826	120, 200	139, 139	259, 339
Rhode Island	258	10, 251	671	7, 352	4, 673	4, 673	9, 346
South Carolina	3, 296	248, 583	14, 434	572, 787	101, 921	101, 921	203, 842
South Dakota	230	8, 858	10	3, 930	23, 457	23, 457	46, 914
Tennessee	1, 739	135, 488	14, 051	525, 947	74, 390	74, 390	148, 780
Texas	359	30, 718	235	7, 157	49, 800	57, 037	106, 837
Utah	225	42, 906	0	0	15, 273	15, 273	30, 546
Vermont	3, 027	75, 908	10, 642	314, 104	69, 500	125, 880	195, 380
Virginia	6, 017	211, 929	107, 690	3, 305, 057	181, 800	286, 201	468, 001
Washington	2, 059	83, 098	20, 529	919, 653	55, 400	82, 140	137, 540
West Virginia	3, 269	73, 727	5, 443	123, 564	70, 600	95, 331	165, 931
Wisconsin	7, 256	168, 645	15, 170	714, 137	215, 600	269, 787	485, 387
Wyoming	5	1, 531	0	0	11, 857	11, 857	23, 714
U.S. total	102, 812	6, 551, 380	682, 077	22, 574, 338	3, 148, 110	4, 235, 932	7, 384, 042
Puerto Rico	2, 202	1, 451	11	1, 030	23, 000	23, 000	46, 000
Grand total	105, 014	6, 552, 831	682, 088	22, 575, 368	3, 171, 110	4, 258, 932	7, 430, 042

TABLE 12.—*Pest control accomplishments, fiscal year 1966*

OAK WILT CONTROL

Ownership or management	Area surveyed	Trees treated	Ownership or management	Area surveyed	Trees treated
National Forest:	*Acres*	*Number*	State and private:	*Acres*	*Number*
George Washington	800, 000	167	Arkansas	8, 000, 000	0
Monongahela	806, 000	100	Pennsylvania	9, 210, 000	531
Ozark	1, 000, 000	0	Virginia	3, 200, 000	97
			West Virginia	8, 840, 000	3, 033
Subtotal	2, 606, 000	267	Subtotal	29, 250, 000	3, 661
			Grand total	31, 856, 000	3, 928

INSECT CONTROL

Ownership or management	Bark beetles, trees treated [1]	Defoliators, area treated	Other insects	
			Area treated	Trees treated [2]
	Number	*Acres*	*Acres*	*Number*
National Forest	763, 706	71, 980	1, 714	71, 472
State and private	216, 409	1, 306	4, 090	[2] 3, 235, 146
Total	980, 115	73, 286	5, 804	3, 306, 618

[1] Includes infested trees, stumps, and cull logs.
[2] Includes 3,145,000 seedlings.

BLISTER RUST CONTROL

Ownership or management	Premaintenance		Maintenance		Ribes eradicated
	Surveyed [1]	Treated	Surveyed [1]	Treated	
	Acres	*Acres*	*Acres*	*Acres*	*Number*
National Forest	245, 736	68, 525	112, 032	5, 417	2, 797, 694
State and private	315, 862	95, 122	1, 424, 817	56, 187	2, 420, 594
Total	561, 598	163, 647	1, 536, 849	61, 604	5, 218, 288

[1] Systematically inspected to locate area in need of treatment and to determine effectiveness of control.

TABLE 13.—*Forest Service receipts and expenditures, all programs and sources, fiscal year 1966*

Item	Receipts	Expenditures
	Dollars	*Dollars*
National forest programs:		
Cash receipts and appropriation expenditures	211, 772, 020	326, 649, 565
Cash receipts from National Forest land collected by and deposited to accounts of other agencies (Federal Power Commission, Department of the Interior)	19, 535, 546	
Noncash income and expense (roads built by timber purchasers)	56, 037, 267	56, 037, 267
Total	287, 344, 833	382, 686, 832
Forest research programs:		
Forest research appropriations		34, 681, 853
Cooperative research work	921, 870	844, 495
Total	921, 870	35, 526, 348
State and private forestry programs:		
Fire protection, tree distribution, and forest management cooperation		17, 815, 521
Assistance to States for tree planting		972, 677
Great Plains conservation program		9, 999
Insect and disease control		1, 672, 622
Flood prevention and watershed protection		2, 784, 120
Forest fire prevention, "Smokey Bear"	43, 046	23, 892
Cooperative funds	2, 249, 184	2, 302, 100
Total	2, 292, 230	25, 580, 931
Work for other Government agencies and non-Government persons and firms:		
Economic Opportunity Program		53, 356, 848
Land and Water Conservation Program	(1)	7, 339, 478
Insect and disease control (Interior Department lands)		35, 201
Miscellaneous work for other Government agencies	3, 945, 028	6, 007, 133
Work performed for non-Government persons, firms, etc.—Cooperative work	2, 971, 557	2, 392, 688
Reimbursed	802, 212	802, 212
Total	7, 718, 797	69, 933, 560
Total receipts and expenditures	298, 277, 730	513, 727, 671
Cash receipts distributed to States, counties, and Puerto Rico as directed by Congress (receipts of fiscal year 1965 except as indicated):		
Payments to States and Puerto Rico (act of June 23, 1908) National Forest fund		[2] 35, 504, 367
Payments to school funds, Arizona and New Mexico (act of June 20, 1910) National Forest fund		112, 130
Payments to Minnesota (Cook, Lake, and St. Louis Counties; Superior National Forest) (act of June 22, 1948) National Forest fund		140, 619
Payments to counties, National Grasslands and land utilization areas (act of July 22, 1937) (receipts of calendar year 1965)		429, 041
Total		36, 186, 157
Internal equipment and supply service (working capital fund):		
Financed primarily by charges included above to Forest Service programs	26, 375, 980	23, 436, 634

[1] Receipts of $1,019,440 from the sale of Federal recreation area entrance permits were deposited to the credit of the Department of the Interior (BOR) during fiscal year 1966 and are not included.

[2] Does not include approximately $3,906,834 due counties from fiscal year 1965 receipts on National Forest O&C Lands. This amount was included in total receipts of $5,209,112 transferred to Interior for distribution under act of Aug. 28, 1937 (50 Stat. 874), as amended.

NOTE: Expenditures are on an obligation basis, except Working Capital Fund, which is on an accrual basis.

U.S. GOVERNMENT PRINTING OFFICE: 1967